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KOREA

STAFF APPRAISAL REPORT

OF A

FOURTH HIGHWAY PROJECT

November 16, 1978

Transportation Division
Projects Department
East Asia and Pacific Regional Office

CURRENCY EQUIVALENTS*

Currency Unit	=	Won (W)
US$1	=	W 485
W1	=	US$0.0021
W1 million	=	US$2,062

*The exchange rate is floating, but the rate used in this report is indicated above.

WEIGHTS AND MEASURES
Metric System

Metric		British/US Equivalents
1 meter (m)	=	3.2808 feet (ft)
1 kilometer (km)	=	0.6214 miles (mi)
1 square kilometer (km^2)	=	0.3861 square miles (sq mi)
1 kilogram (kg)	=	2.205 pounds (lbs)
1 liter (l)	=	0.2759 US gallons (gal)
	=	0.2207 British gallons (imp gal)
	=	1.1023 US short tons (sh ton)
1 metric ton (m ton)	=	0.9841 British long tons (lg ton)

ABBREVIATIONS AND ACRONYMS

aadt	-	Annual average daily traffic
AC	-	Asphalt Concrete
BPR	-	Bureau of Public Roads (MOC)
BRD	-	Bureau of Regional Development (MOHA)
DBST	-	Double Bituminous Surface Treatment
EPB	-	Economic Planning Board
ERR	-	Economic Rate of Return
FFYP	-	Fourth Five-Year Plan
GNP	-	Gross National Product
KHC	-	Korea Highway Corporation
KNR	-	Korean National Railroad
MOC	-	Ministry of Construction
MOF	-	Ministry of Finance
MOHA	-	Ministry of Home Affairs
MOT	-	Ministry of Transportation
NHMO	-	National Highway Maintenance Office (MOC)
PCB	-	Provincial Construction Bureau
TCMO	-	Territorial Construction and Management Office (MOC)
TCC	-	Transport Coordination Committee
TCO	-	Transport Coordination Office (MOT)

FISCAL YEAR

January 1 to December 31

KOREA

STAFF APPRAISAL REPORT OF A FOURTH HIGHWAY PROJECT

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MAP

KOREA

STAFF APPRAISAL REPORT OF A
FOURTH HIGHWAY PROJECT

1. TRANSPORT SECTOR

A. General

1.01 The rapid economic growth of Korea in the past decade, coupled with industrialization, has resulted in major developments and changes in the transport sector: freight and passenger traffic tripled between 1966 and 1976; and results for 1977, the first year of the Fourth Five Year Plan 1977-78 (FFYP), show a continuation of the trend. This rapid growth in transport demand was accompanied by a greater diversification among modes, as railways lost their predominant position and road transport and coastal shipping increased their share.

1.02 Traffic statistics (Tables 1.1 /1 and 1.2) illustrate these changes over the 1966-76 decade. The rail transport share of freight traffic fell from 78% of total ton-km to 45%, while road and coastal shipping shares increased respectively from 12% to 30% and from 10% to 25%. For passenger traffic, the rail share of total passenger-km fell from 43% to 25% over the decade, while the road share increased correspondingly from 56% to 74%. These changes very much reflect the economic advantages of the various modes, as rail and coastal shipping increasingly concentrate on long distances and bulk commodities, while road transport handles short distance and more diffuse traffic.

1.03 As Korea's economy continues to grow and diversify, transport demand will continue to experience a parallel expansion. Internally, the transport system will have to cope with larger movements of bulk commodities, such as coal, cement, ores and oil. The industrial complexes being developed along Korea's south and southeast coast will necessitate the import of large amounts of raw materials and the transfer of intermediate products between plants. A more dispersed demand for nonbulk freight and passenger transport will follow the general increase in GNP.

1.04 Recognizing the necessity for the transport sector to keep up with the growing economy, the Government's basic policy in the Fourth Five Year Plan 1977-81 (FFYP) is to develop the transport system to meet increases in traffic demand. Among the other objectives stated in the FFYP documents the most important are: (a) to increase transport efficiency and promote economic allocation of traffic among modes; (b) to reduce the fiscal burden imposed on the Government by the railway by increasing rates and improving its operations; and (c) to favor maintenance expenditures over new investment. Other lesser objectives are described in detail in the Bank's latest Basic Economic Report dated February 23, 1977 (Reference A1). /2

/1 Tables are given in Annex 1.

/2 Refers to material in the project file and listed in Annex 2.

1.05 The FFYP investment allocation for the transport sector is Won 2,780 billion (US$5.7 billion), or 14.6% of total investment. It is expected that 45% (Won 1,258 billion) will be invested by the public sector in infrastructure and equipment. The remaining 55% (Won 1,526 billion) will be invested by the private sector, primarily for road vehicles and ships. The allocation for transport investment in the Fourth Plan is about 50% higher in real terms than in the Third Plan (Table 1.3). Forecast transport demand indicates that the proposed investment should provide for increases of about 34 billion passenger-km and 12 billion ton-km, respectively 30% and 180% more than during the Third Plan, thereby justifying the substantially larger capital allocation. The allocation among modes reflects the increasing importance of road transport and coastal as well as international shipping; proposed investments in these modes are, respectively, 47% and 80% above the Third Plan, while railways are allocated only 25% more than in the previous plan.

B. The Transport System

Highways

1.06 The present highway system is still inadequate to cope with the rapid growth of road transport, despite the Government's effort since 1968 to develop a modern road network. Only 58% of the national roads, 8% of the provincial roads, and 3% of the county roads are paved, and a high level of investment will continue to be required. The Bank Group has financed three highway projects, totalling US$191.5 million: Loan 769-KO in 1971 (US$54.5 million), Loan 956-KO in 1974 (US$47 million) and Loan 1203-KO in 1976 (US$90 million) jointly with a Loan by the Saudi Fund for Development. Performance on these projects generally has been satisfactory. Details on the subsector are given in Chapter 2.

Railways

1.07 As mentioned above, major structural changes occurred in the transport sector over the last decade: the transport system is now evolving into a more balanced multi-modal system in which different traffic modes complement each other according to their technical and economic characteristics. Cost comparisons indicate that rail transport is still the most economic means of moving bulk traffic over medium and long distances, and also has an important role to play in long distance passenger traffic. In 1977, about 77% of rail freight traffic consisted of six bulk commodities, as against 69% in 1966. In addition to its long distance hauling of bulk freight and passengers, the Korean National Railroad (KNR) will play a growing role in providing rapid transit service for Seoul and its suburbs.

1.08 KNR, as a semi-autonomous agency within the Ministry of Transportation (MOT) operates 3,097 route-km of standard gauge and 47 km of narrow gauge. About 320 km of single track industrial lines, between the northeast and Seoul as well as about 100 km of suburban lines in Seoul are electrified.

KNR employs nearly 40,000 people of which 34,000 are permanent employees. Staff productivity in terms of traffic units (pass-km plus net ton-km) per employee is high (700,000 in 1977) compared with other railways; this is due to the dense urban and inter-city passenger travel and heavy bulk commodity traffic as well as to the excellent discipline and productivity of the staff.

1.09 In 1977, KNR carried 47 million tons of freight over an average distance of some 220 km resulting in 10.5 billion ton-km. Freight traffic was 8% above 1976. Long distance passenger traffic continued its rapid growth restarted in 1973, after a few years of diminishing traffic resulting mainly from the opening of the Seoul-Busan Expressway. In 1977, KNR carried 162 million long distance passengers achieving 14.6 billion passenger-km or an 18% increase over 1976. KNR earned positive returns until 1971; since then, its financial situation deteriorated due to sharp inflation which increased costs substantially while tariffs were maintained at low levels by Government. Under the Sixth Railway Loan (1542-KO) which was approved in March 1978, the Government agreed to implement a financial recovery plan for KNR; its main feature being that in the future, tariff increases will be tied annually to increases in the wholesale price index. On the basis of the plan, positive returns should be restored by the end of 1979.

1.10 Since 1962, Bank Group has assisted KNR through six projects amounting to US$340 million. The first three lending operations have been satisfactorily completed. Disbursements of the Fourth Railway Project (Loan 863-KO) are 96% completed, but the Closing Date has been extended to March 31, 1979, to allow for disbursements for equipment with long delivery times. The Fifth Railway Loan (1101-KO) made in 1975 for US$100 million is over 85% disbursed and will be completed by mid 1979. The Sixth Railway Loan (1542-KO) became effective on August 3, 1978, and bids for about 90% of the Bank financed items have been obtained.

Ports and Shipping

1.11 Freight traffic through the ports has increased from about 13 million tons in 1966 to over 80 million tons in 1976. This tremendous increase resulted in serious port capacity problems, particularly at Busan, the largest port, which handles 20% of the country's external trade and is chronically congested. The Bank has assisted development in Busan through two port projects totaling US$147 million and ADB is financing the expansion of Incheon, the port nearest to Seoul. The Saudi Fund for Development participated in the financing of the first Busan Port Project. The Government has also proceeded to develop a number of specialized ports in connection with industrial development. The latter is largely concentrated on the coast: i.e. Bugpyeong for cement, Pohang for the inputs and output of the steelmill, Ulsan for refinery and petrochemical, Onsan for a refinery and nonferrous metal industry, Changwon (engineering) and Samil (Yeosu) for fertilizer and petrochemicals.

1.12 The role of coastal shipping has greatly increased in the last decade, from 10% of the ton-km moved in Korea in 1966 to 25% in 1976. This is mainly due to the construction of industrial complexes on coastal locations, and, to a lesser extent, to shortages in rail and road capacity. Korea's

share in the merchant shipping of its external trade has been increasing and reached about 38% of the total tonnage handled in 1976.

Aviation

1.13 Although domestic air passenger traffic grew rapidly until 1973, it still amounts to less than 1% of total passenger-km; air-freight is also negligible. Domestic routes are served by the privately-owned Korean Airlines (KAL), which also operates internationally. Most international traffic is handled at the Seoul-Kimpo International Airport; other international airports are at Busan and at Jeju Island, a major tourist center.

C. Transport Policy Planning and Coordination

1.14 The Government set up in 1970 a Transport Planning Office on the recommendations of a study by consultants under the Bank Technical Assistance Project - Transport, Credit S4-KO, and with assistance provided under that Credit, the First Highway Project Loan 769-KO, and the Third Railway Project Credit 183/Loan 669-KO. Over the past three years, the Government has taken steps to further improve transport coordination. In 1975, this function was reorganized by the establishment of a Transport Coordination Committee (TCC) consisting of nine directors, representing ministries most directly concerned with transport matters, and a Transport Coordination Office (TCO) in the Ministry of Transportation (Chart 1-19013)./1 The TCO is headed by a director general, who also acts as Chairman of the TCC. Its main functions are to collect data and assist in the formulation and review of transport policies, especially those related to pricing and regulation.

1.15 While the charter of the TCC includes intermodal coordination of transport sector investments, the TCC has not in fact exercised this function. The Economic Planning Board (EPB), which exercises budgetary control and plays a senior role with regard to all other ministries, has the dominant role in decision on investment projects. EPB intends to make much more intensive reviews of investment projects and has established a separate Bureau of Project Evaluation to this end. Sector studies covering major aspects of transport coordination have been identified by the sector mission and are partly financed under the Sixth Railway Loan (1542-KO). They will be carried out under the supervision of EPB.

1.16 This approach appears much more satisfactory and workable than the one where investment coordination was to come under one of the ministries, namely MOT. The role of the TCO should remain to collect basic data in the sector and assist in the formulation and review of transport policies, especially those related to pricing and regulation, since MOT is responsible for licensing and rates and fares setting.

1.17 The Bank should continue to assist the Government in increasing the capacity of its transport system to cope with the demand resulting from

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/1 Charts are given in Annex 1.

the continuous rapid development of the country. Since transport infrastructure is capital-intensive, the Bank can help to ensure through careful sector review and project preparation that capacity increases are provided at the least cost to the economy, and that efficient use is made of existing capacity before increasing it.

2. HIGHWAY SUBSECTOR

A. The Network

2.01 The public road network totals about 80,000 km consisting of 9,400 km of national highways, 10,900 km of provincial roads, 12,500 km of gun or county roads, and some 47,000 km of village access roads. Among the latter, about 36,000 km had been constructed and improved under the self-help Saemaul Movement at the end of 1977. In addition, there are 12,900 km of city roads which are mostly streets (Table 2.1). The national highways include about 640 km of grade separated toll expressways, of which about 500 km are four-lane divided and 140 km are two-lane.

2.02 The road density is generally sufficient to serve transport needs, particularly as around 70% of the total land area is mountainous, but the condition of most of the road network is inadequate. Up to 1967 little had been done to improve the roads. Even the national roads were only about 15% paved. The remainder were in bad condition, narrow, with poor drainage, rough gravel surfacing and often badly aligned, with average driving speeds of around 20-25 kph. Even now only 58% of the national highway system is paved, and 8% of the provincial roads (compared with about 95% and 20% respectively in Thailand). Further, the unpaved roads, including those which are national roads, remain in a poor state. In spite of some improvement in the maintenance of national roads, average driving speeds on them are still only in the range of 25-35 kph. There is thus an urgent need to improve the highway network, particularly through: (i) reconstructing and realigning a few major trunk routes; (ii) paving virtually all remaining national highways, and those provincial highways with high traffic volumes; (iii) improving gravelled and unsurfaced roads, chiefly through instituting an adequate system of maintaining provincial and gun roads.

B. Traffic and Road Transport Industry

Motor Vehicles

2.03 The motor vehicle fleet in Korea is still small when compared with other countries of similar and even lower income levels. The 275,000 four wheel road vehicles presently registered in Korea amount to only 7.9 per 1,000 persons (Table 2.1). The ratios are 14.3 in Thailand, 15.4 in the Philippines, and 48.2 in Malaysia. Only Malaysia has a higher per capita income than Korea. There are many reasons why Korea's vehicle fleet is small: the high taxation of private cars, the restrictive licensing of

commercial vehicles (para. 2.10), the high cost of locally manufactured vehicles (para. 2.06), and the recent development of the road network. Only 15 years ago, Korea had less than 1,000 km of paved roads.

2.04 The vehicle fleet has, however, been growing rapidly. Growth averaged 15% p.a. during the First Plan (1962-66), and 20% p.a. during the Second Plan (1967-71). Growth slowed down during the early years of the Third Plan due to the economic stabilization policy in 1971-72 and the oil crisis in 1973-74. Since 1975, however, the growth has accelerated again to 13% in 1976 and 25% in 1977. Of all vehicles, private cars increased the fastest, almost doubling since 1974. While the growth rates for private cars are high, 40% in 1977, the actual number is still small. The situation may be compared to that of Japan 20 years ago, when the income level was similar to that of Korea today and the number of cars was 2.8 per 1,000 inhabitants (Korea 3.3 in 1977). Since then, the car population exploded in Japan, passing from 200,000 in 1958 to about 20 million in 1977 or almost 175 per 1,000 inhabitants. Will Korea follow the Japanese pattern? It will depend upon the willingness or ability of the Government to keep the current high level of taxation in line with increasing incomes. Assuming that incomes continue to rise rapidly, a high level of taxation would be the only way to check the explosive growth of private cars. The combined pressure of the public and the car manufacturers may force Government to let the taxation of private cars erode in relation to incomes.

2.05 In line with the Government's policy of developing a domestic motor vehicle manufacturing industry, local production has increased rapidly over the last decade from about 7,000 four wheel vehicles in 1967 to 75,000 in 1977 (Table 2.3). This growth was fostered by restrictive import licensing and high customs duties on foreign assembled vehicles. As a result, nearly all motor vehicles are locally assembled, and contain an increasing proportion of locally manufactured parts. There are four local manufacturing/assembly plants with joint participation of Korean firms and General Motors, Ford, Fiat and Honda, but in 1975, Hyundai produced the first 100% Korean car, and about 10,000 were exported in 1977 to the Middle East, West Africa and Latin America.

2.06 The industry's capacity is 205,000 four-wheel vehicles/year, still three times above the 1977 production level. This explains the relatively high cost of motor vehicles in Korea. However, despite inflation and rising incomes, car prices have increased little over the last few years reflecting improved capacity utilization. Forecasts indicate that production will overtake present capacity in 1980 and reach 330,000 by the end of the FFYP in 1981 , with export accounting for half of the production.

Road Transport and Traffic

2.07 As mentioned in Chapter 1 (para. 1.02), road transport has grown rapidly over the last 10 years, not only in absolute terms but also in relation to other modes, particularly railways. Freight traffic on highways (ton-km) represents almost one-third of such traffic on all modes versus only 12% in 1966. During both the Second and Third Plan periods, road freight

traffic grew twice as fast as all freight traffic, averaging 38% p.a. in 1967-71 and 10.5% p.a. in 1972-76. The share of freight traffic by road is expected to continue increasing in the long term, although probably more gradually. Comparing again with Japan, the road share of freight transport, there, increased from 12% in 1955 (Korea's level in 1966) to 36% in 1975.

2.08 Intercity passenger traffic on highways also grew very rapidly, at 16.6% p.a. in 1972-76. As a result, in 1977, two-thirds of the travel was done by road and one-third by rail, compared to the reverse proportion in 1966. The trend is expected to continue as the railways concentrate more on their long distance express services. Until the opening of the Seoul subway in 1974, all urban transport was by road, and road transport will remain the predominant mode in urban areas.

2.09 Traffic counts on the national highways have been made since 1965 by the Ministry of Construction (MOC), assisted by the provincial authorities and are now carried out twice a year. Their reliability has been improved, and they are now used in planning highway improvements. In accordance with the Agreement for the Second Highway Project (Loan 956-KO), MOC began to count, record and analyse traffic data on the provincial highway system in 1973. By 1977, there were regular counts at 385 points on the provincial roads, covering 30% of the system. During negotiations it was agreed that, by the end of 1980, traffic counting would be extended to the entire provincial system (para 5.01(a)). In 1977, the Government established 19 permanent counting points to monitor traffic trends in the country on a continuous basis. Pending results from these permanent counts, the overall traffic growth can be related to fuel consumption (Table 2.4). Annual growth rates were high during the First and Second Plan period 1962-71, but fell off in the Third Plan 1972-76. This was particularly marked for gasoline following the oil crisis; consumption in 1975 was one-third lower than in 1973. Rapid growth resumed in 1976 and 1977.

Road Transport Industry Regulation

2.10 Commercial vehicle licensing has been rather restrictive in Korea. Restrictions included: (a) issuing licenses only to enterprises having a minimum of 20 vehicles in cities or 10 in rural counties; (b) imposing quotas on total numbers of vehicles in each province as well as service areas or routes;/1 and (c) regulating rates and fares for freight and passenger traffic. In line with the Loan Agreement for the Second Highway Project, (Loan 956-KO) the Government has partially relaxed the restrictions above.

2.11 Regarding the minimum number of vehicles necessary to obtain a license, the requirements were lowered at the county level from 10 to 5 vehicles. Regulations were also amended to allow waiving these requirements, when deemed necessary, in view of transport demand and applications in particular areas. All requirements were removed for pick-up truck services,

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/1 An "area" license authorizes service within a limited area generally the Province, and a "route" license authorizes service along a given route between points A and B.

and allowance was made for the licensing of owner-operators of taxis and "area" trucks. As a result, about 4,000 owner-operator taxis were licensed in 1977, over 3,000 of which in Seoul. Owner-operators of "area" trucks are required to join in associations with a minimum of 5 trucks at the county level. Regarding route and area regulations, "area licensed" trucks are now allowed to accept cargo for delivery outside of their assigned area thus competing with route trucking. Regulations concerning buses remain virtually unchanged. The reason given by Government is that present regulations are necessary to ensure regular service and safety.

2.12 Presently 772 trucking companies operate in Korea, 740 under "area licenses" and 32 under "route licenses" (Table 2.5). The number of companies increased 15% since 1974 while their average size in terms of number of trucks was reduced from 48 to 45 trucks. Partly because of restrictive licensing, but also because of the rapid growth and diversification of the manufacturing sector, the private truck fleet has grown faster than the common carrier fleet (Table 2.2, page 3). In 1977, the private truck fleet numbered 70,000 versus 42,000 for the common carrier fleet, while in 1967, the common carrier fleet of 15,000 was almost three times as large as the private fleet. There are 460 bus companies operating almost 22,000 buses, of which half are used for urban services (Table 2.5).

2.13 MOT is currently reviewing the licensing system with a view to further relaxation. It will also monitor the effect of allowing owner-operator taxi and truck operation in regard to insurance policies, accident claims, levels of services, financial viability and other aspects of their operations. A time schedule for completing the above analyses was agreed with Government during negotiation (para. 5.01(b)).

2.14 Consultants reviewed existing regulations on vehicle weights and dimensions as part of the maintenance study carried out under the First Highway Project. This showed that the existing legal limits were reasonable, including a 10-ton single axle load, but that they should be extended to cover semi-trailers and trailer combinations. A 35-ton limit was proposed for all vehicles, and a 16-ton limit for tandem axles. The Government accepted the recommendations and amended the regulations accordingly, fulfilling an agreement of the Second Highway Loan.

C. Highway Administration

2.15 The responsibilities of national and local authorities for the various classess of roads are summarized in Table 2.6. National roads are the responsibility of the MOC (Chart 2-19014), through its Bureau of Public Roads (BPR) (Chart 3-19015). The MOC delegates to the Korea Highway Corporation (KHC) (Chart 4-19016) responsibility for those national highways on which tolls are imposed, including their design, supervision of construction, and maintenance, as well as administration and toll collection; financing of the KHC's administration and its road maintenance is through the toll revenues. Lower standard roads are the responsibility of the local authorities under the Ministry of Home Affairs (MOHA) (Chart 5-19017). These roads include

provincial, under the nine Provincial Construction Bureaus (PCB) (Chart 6-19018), and city and county roads under the City and County (Gun) Construction Sections (CCS) (Chart 7-19019). In addition to its responsibility for national roads, the MOC advises the Government on policy concerning other roads.

2.16 The organization of the MOC, including its BPR, is satisfactory for carrying out all its functions in regard to national highways, subject to adequate budgetary provision being made for maintenance (paras. 2.31 and 2.32). The MOC organization has evolved with the aid of technical assistance and financing provided by the Bank. Technical assistance for setting up the BPR, and for its initial operations, was financed during 1968-1971 under Credit S4-KO, (which was incorporated into the First Highway Project, Loan 769-KO, in 1971). Further technical assistance for setting up the MOC's field organization for maintaining national highways and for procuring maintenance equipment, was provided under the First and Second Highway Projects, Loans 769-KO and 956-KO, during the period 1971-1976. The Bank financed projects have also included training partly through overseas courses, but mainly through attachment of counterpart staff to consultants for the various studies carried out under all the highway projects and covering road maintenance, planning, feasibility studies, design and construction supervision.

2.17 The Korea Highway Corporation (KHC) was set up by the Government in January 1969 to operate and maintain toll highways and, where so required by the Government, to supervise the construction of further highways, mostly intended also to be operated with tolls. The KHC is semi-autonomous, with its own Board of Directors, Budget and is self-accounting, but is subject to the general direction of the Minister of Construction. The KHC presently operates 1,020 km of toll highways (Seoul-Incheon, Seoul-Busan, Suweon-Woeonju-Saemal, and Daejon-Gwangju-Masan-Busan). It supervised construction of the last two highways, and of a further 215 km of highways which are toll free, but are maintained by KHC (Saemal-Gangreung-Mugho, and Daegu-Masan). Its Articles of Association also permit KHC to finance construction, though it has not so far done so. In accordance with the Loan Agreement for the Third Highway Project (Loan 1203-KO), the Government prepared and sent to the Bank for comment a policy statement, based on a report prepared by consultants, on the Government's toll road system and the KHC. The policy statement sets out the limitations and Government controls under which the KHC operates. Firstly, before designating any road as a toll road, the Government requires a study to be carried out to determine the economic and financial implications and to establish an operating system, and levels of tolls, which will limit economic losses through diversion of traffic. This normally means an "open" system of toll collection with a limited number of toll collection gates on the highway itself, and unrestricted access at all intersections with public roads, rather than a "closed" system where toll gates are set up at all points of access which are usually restricted in number. The levels of tolls are subject to review by the EPB and agreement by the Government. After review of studies completed by KHC in October 1978, the Bank accepted the Government's proposal to impose tolls on the Saemal-Gangreung and Daegu-Masan roads from January 1979. The KHC is technically competent, the roads in its care are well maintained, and it has ample financial resources through the tolls collected.

2.18 The provinces through their Provincial Construction Bureaus (PCB) are responsible for planning, construction, maintenance and administration of the provincial roads and counties (Guns) and cities are similarly responsible for local roads. However, the provinces and counties have severe limitations in their organizations, staffing, equipment and financing. Most of the planning and major construction and improvement of provincial roads has so far been handled by MOC, which is presently carrying out a study of the provincial roads system (as well as the national road system) under the Third Highway Project, Loan 1203-KO. So far, development of the county road system has been limited mainly to minor improvements. Maintenance of provincial and county roads is generally poor. The MOHA has general responsibility for control and direction of the provincial and local authorities, but presently does not have any organization within the ministry to deal specifically with works. Improvement of the organization, staffing, equipment and financing of the provincial and local authority works organizations is needed, with particular priority for improving road maintenance. To formulate an action program for such improvements; a study is included in this project (paras. 3.07 and 3.08).

D. Staff and Training

2.19 As noted in para. 2.16, the MOC/BPR was reorganized, and its staff trained with assistance provided under previous Bank financed highway projects, including the training of 11 of the staff in oversees institutions. However, during the last two years there has been a severe loss of staff chiefly to the Korean construction industry which has been enjoying boom conditions, including a vast amount of construction overseas. The MOC lost nearly 50% of its engineering staff while the Planning Division of the BPR lost over 80% of its staff. However, the MOC has taken vigorous action to recruit new staff and the present deficiencies are only about 15% in numbers. The large influx of inexperienced staff is naturally causing some problems, and placing a burden on the remaining staff, but commendable progress is being made in absorbing the recruits. To assist in replacing the losses of more senior and highly trained staff, further assistance is being provided under this project for overseas training of further staff members of the MOC (para. 3.09). The staffing and training needs of the provinces and local authorities will be established through the study of organization and maintenance for provincial and county roads (para. 2.18).

E. Highway Planning and Financing

2.20 Planning of the national system is the responsibility of the MOC and is carried out by the Planning Division of the BPR. The Division carries out traffic surveys and maintains an inventory of national highways. The BPR drafts the Five-Year Development Programs and Annual Budgets for development. The drafts are reviewed by the MOC and revised in consultation with the EPB and Ministry of Finance (MOF) and finally incorporated into the National Five-Year Economic Development Plans and Annual Budgets. In reviewing the drafts, the aim is to make the programs consistent with the national

development and financial targets established by the EPB and the MOF. The BPR is also responsible for giving technical advice on all highway matters to the Government, including the MOHA and the provinces; it reviews proposals originating from these bodies for road improvements and grants for maintenance. The Planning Division of the BPR is now competent to carry out feasibility studies for road projects. However, over the last two years staff turnover of the Division was over 80% due to the high demand and attractive salaries of the private sector and new staff will have to be trained (paras. 2.19 and 3.09).

2.21 Planning of provincial roads is the responsibility of the provinces, and city and county roads are planned by the local authorities concerned; these local governments are under the jurisdiction of MOHA particularly regarding budgetary matters. Planning at this level has been minimal and largely on an ad hoc and political basis, except for the few provincial roads on which major improvements have been carried out by the MOC. This was acceptable since little other investment has been made in provincial roads and even less in gun roads. The Government has so far given priority to the improvement and paving of the national road system needed to carry the very rapid increase in traffic resulting from, and needed to support, sustained strong economic growth (paras. 1.02 and 2.07). Improvement and paving of the national system is now well underway. About 60% has been paved and the Government aims to have nearly 90% paved by 1982. The emphasis is gradually shifting to the development of provincial roads and gun roads, and adequate planning for these roads is thus becoming more important. A study of the needs and priorities for the upgrading and improvement of the provincial road network, financed under the Third Project (Loan 1203-KO), is already underway, under the management of MOC. This proposed project includes a study for the maintenance of provincial and gun roads and for the improvement of gun roads. The study will include recommendations for improving the organizations concerned with provincial and gun roads and their planning, design, administration, maintenance and financing (paras. 3.07 and 3.08).

2.22 Road expenditures during the FFYP 1977-81 are planned to total W 458 billion at 1975 prices or about US$940 million equivalent. Actual expenditures during the First, Second and Third Plans are given in Table 2.7. Since they are five-year totals of current annual expenditures, they are not directly comparable with the FFYP total expressed in constant 1975 prices. However, a reasonable assumption on the yearly distribution of expenditures combined with adjustment for variations in the wholesale price index indicates that road expenditures totalled about W 300 billion in 1967-71 and some W 350 billion in 1972-76 both in constant 1975 prices. The current plan thus represents a 30% increase in real terms over the previous one. This appears reasonable in view of traffic forecasts indicating a 70% increase in both freight ton-km and passenger-km transport by road during the FFYP.

2.23 Proposed road expenditures in the FFYP still reflect the Government's priority of completing the improvements of the basic national road system (Table 2.8). However, the share of national roads expenditures in the total is gradually being reduced. It is planned at about 65% in the FFYP versus 74% and 72%, respectively, in the Second and Third Plans.

The share of maintenance was also planned to increase for national roads, as the new maintenance organization became fully operational in 1976. Maintenance expenditures on national roads were planned to take 20% of total expenditures on these roads versus only 2% and 6%, respectively, in the Second and Third Plans. However, budgetary allocations to MOC for maintenance in 1977 and 1978 have fallen short of the planned amounts (para. 2.32). In 1977, maintenance expenditures amounted to less than 10% of total expenditures on national roads.

2.24 Total road expenditures in 1977 (Table 2.9) amounted to W 146 billion (US$300 million) excluding W 69 billion spent by the special cities of Seoul and Busan. This amount exceeded the planned amount by about 50% in real terms. As maintenance expenditures were smaller than planned, all the increase went to construction.

2.25 Expenditures on roads have been much lower than revenues from road user charges during the Third Plan period when 1972-76 revenues totalled W 610 billion or US$1,260 million (Table 2.10) and road expenditures W 270 billion (excluding Seoul special city). In 1977, revenues reached W 203 billion versus expenditures of W 158 billion, excluding Seoul and W 215 billion when Seoul is included. The tax structure was substantially modified on July 1, 1977, with the introduction of the Value Added Tax (VAT) replacing various other taxes on fuel as well as on vehicles. Excluding VAT, which affects equally all sectors in Korea, road user charges revenues are expected to be down to W 170 billion in 1978. Taxation is particularly high on private cars, the main taxes being on acquisition, about 30% of the value added, and on ownership, with the yearly tax around W 200,000 (US$410) for a small car. Taxes on gasoline, excluding VAT, are around 200%. Taxes on commercial vehicles are more moderate, amounting to about 10% of total operating costs for trucks and buses; taxes on diesel fuel, excluding VAT are only 25%.

F. Engineering

2.26 The MOC, through its BPR, has overall responsibility for the design of national roads, including toll highways. It has established standards for national roads and for other government financed road works and for reviewing proposals submitted by provinces and local authorities. Design standards established for national, provincial and county (gun) roads, are shown in Table 2.11. They are reasonable for national roads and also for a substantial number of provincial roads, a few county roads where traffic levels are likely to justify paving within the period of about 10 years. However, the present standards for provincial and country roads will be reviewed during the study of such roads under this project, and consideration given to establishing possible further standards for roads carrying lower traffic volumes.

2.27 The BPR does not itself have staff for carrying out detailed engineering. This is undertaken usually through the MOC's Territorial Construction and Management Offices (TCMO) for smaller works, but consultants are usually employed for design of major construction projects. Supervision of construction is also carried out by the TCMO's with the assistance of

consultants on major projects. The provinces, through their PCBs are normally responsible for design of provincial roads. However, in practice, most major improvements of provincial roads have so far been designed under the direction of MOC, mainly employing consultants. The counties (guns) are similarly responsible for county roads, but little substantial construction of such roads has so far been carried out. The provinces, and to a lesser extent, the counties, have some engineering staff but their capacity to design and supervise construction works is limited; as far as roads are concerned, they are chiefly employed in carrying out the currently inadequate level of maintenance works.

2.28 Korea now has many firms of consulting engineers, including about 30 firms handling civil works. Most of the firms are rather small, and some are specialized, for example, in laboratory testing. However, the ability, range of experience, and capacity of a number of the firms have increased markedly in the last few years. Partly this has been fostered by their association with foreign firms, including those employed on previous Bank-financed projects. The position has now been reached where foreign firms supply only a nucleus of key staff chiefly to assist the MOC in overall management and coordination of studies, with particular reference to identifying alternatives and carrying out economic analyses, for which the Korean firms so far have limited capability. After the feasibility studies have been completed, and alignments, standards, etc., selected, the detail engineering is carried out almost entirely by local firms. Participation of foreign firms is limited at that stage, and for supervision of construction, to overall management and assistance with special problems.

G. Construction

2.29 The Government's policy has long been to carry out construction through contracts awarded after competitive bidding. Only minor improvements for small-scale local works such as those carried out through the Saemaul village self-help program are undertaken by force account. This Government policy, together with a large and growing volume of construction works in Korea, has fostered the growth of a large, efficient and flourishing contracting industry. There are over 500 construction companies handling civil engineering and building construction. Of these, 45 firms are qualified to undertake projects exceeding $10 million, 115 firms projects up to $10 million and 185 firms projects up to $5 million. Furthermore, the industry has expanded rapidly in its overseas activities, where it has been equally successful. Korean contractors completed overseas work totalling about US$3.5 billion during 1977 and the amount may be even greater in 1978. At the same time the industry is successfully carrying out a very large volume of public works, and of industrial and housing development in Korea. Although many projects in Korea are open to international competition, and some foreign firms have prequalified for bidding, they have not been successful in obtaining work in the face of strong domestic competition. The successful development of the Korean contracting industry might serve as a model for a number of other countries.

2.30 Contractors are left to choose their own construction methods, subject to meeting performance specifications. This policy, in conjunction with a strong entrepreneural drive, a competitive and generally undistorted market, and a steadily growing demand, has resulted in efficient construction methods and balance of equipment and labor. Contractors are able to obtain imported equipment, and local production and assembly of construction equipment is now evolving. Because of the rapid expansion of construction work, there have been some instances of temporary shortages of materials, such as cement in 1977. However, the major expansion of the local cement manufacturing industry has overtaken the shortage.

H. Maintenance

2.31 The MOC has set up a satisfactory organization for maintaining national roads (para. 2.16) but the budgetary allocation has so far been insufficient. It has therefore in effect been possible to carry out only routine maintenence but not periodic maintenance, particularly of paved roads, of which there is a large and growing backlog of work. The KHC is satisfactorily maintaining the toll roads (para. 2.17); financing is from tolls and expenditure is at about three times the MOC rate per km of road with equivalent construction and traffic. Maintenance of provincial and county (gun) roads is not satisfactory (para. 2.18).

2.32 The MOC field organization for maintaining national roads was set up with technical assistance and equipment financed under the First Highway project in a pilot province in 1972, and for the remainder of the country financed under the Second Highway project, in 1975-76, and in accordance with an agreed time schedule as modified under the Third Highway project. Experience has shown that to further increase efficiency of MOC's routine maintenance operations, some additional equipment is required, which will be financed under this project (para. 3.06). However, the Government has so far provided only about half the budget funds needed to carry out an adequate program of maintenance recommended by consultants in their study of maintenance of national roads. The recommended program of maintenance was agreed by the Government and confirmed in a supplemental letter to the Third Highway project, including target annual budgetary provisions through 1979, but the budgetary provisions for maintenance during 1977, the first full year of operation, and 1978, have been only about half the target figures, when adjusted to current prices. The actual allocations, and adjusted target forecasts (excluding equipment depreciation) were: for 1977 W 6.1 billion and W 13.3 billion; for 1978 W 7.9 billion and W 15.9 billion. The deficiency has been brought to the notice of the Government during missions and a number of times in correspondence.

2.33 During negotiations, the Government provided details of its budgetary provision for maintenance of national roads during 1979 totaling Won 15.4 billion and estimates of funds required for each of the years 1980 through 1983. They indicate that the estimated annual provision for 1979 agreed under the Third Highway Project would (at constant prices) be reached in

1980. The estimated amounts should enable the national highway system to be brought to an adequate level of maintenance over the five-year period and are considered acceptable. The amounts are expressed in constant (estimated mid-1979) prices and will require adjustment annually to take account of changes in prices. The budgeted amount for 1979, and estimates for 1980 through 1983 are:

		(Won billion)/a				
		1979	1980	1981	1982	1983
(i)	Administration	2.1	2.2	2.3	2.4	2.5
(ii)	Routine Maintenance (predominantly by force account)	3.6	4.5	4.6	4.8	4.9
(iii)	Periodic Maintenance (predominantly by contract)	9.7	13.3	14.1	15.3	15.1
	Totals	15.4	20.0/b	21.0/b	22.5	22.5

/a Estimated budgetary requirements at constant (estimated mid-1979) prices, including costs of operation , repair and replacement of equipment (which is predominantly used on routine maintenance), but excluding costs of special highway police patrols.

/b Includes procurement of additional maintenance equipment under the project of W 1.0 billion in 1980 and W 0.85 billion in 1981.

2.34 Now that the organization for national road maintenance is satisfactory, attention should be given to improving maintenance of the provincial and county (gun) roads. The present organization, staffing, equipment and financing for these roads, including their maintenance, is inadequate at national, provincial and county levels (para. 2.18). The needs, and a program and time schedule for improvement, will be formulated under the study included in this project (para. 3.07).

I. Previous Bank Financed Highway Projects

2.35 The three previous Bank financed highway projects (para 1.06) have had a major impact in assisting the Government with the construction and improvement of its national road system, with institution building in MOC, and with formulating revised policies affecting the whole transport sector. Assistance with institution building was given for setting up the BPR, and the MOC's field oganization for maintaining national highways, and for

improving the MOC's road planning. The technical assistance also extended to helping to set up a Transport Coordination Office in MOT. Significant policy changes which were evolved through the highway projects include the adoption of more appropriate road standards, relaxation of restrictive licencing of the road transport industry, revision of regulations governing vehicle weights and dimensions, and a modified Government policy on toll roads. A major advance is the introduction of a satisfactory organization for maintaining national roads, which should be fully effective when it receives adequate budgetary provision. Indirectly, the three highway projects have helped promote the Korean contracting industry through a steady and gradually increasing stream of contracts, and Korean consulting firms through their association with foreign consultants on the design of the projects.

2.36 In view of the major advances in the Government institutions and policies concerned with national roads, and subject to adequate future budgetary provision for their maintenance, there will be no serious institutional impediment to adopting sector lending as far as national roads are concerned. However, in regard to provincial and county (gun) roads, which will absorb an increasing proportion of investment in the road subsector, institutional improvements are required, particularly in regard to road maintenance. This project will include studies of the institutions concerned with provincial and county roads, and their financing. This will prepare an action program for introducing the improvements found to be needed. However, pending substantial progress being made, which may take several years, this project must be considered as in a transition period towards sector lending.

3. THE PROJECT

A. Background and Objectives

3.01 The Government's Fourth Five Year Plan (FFYP) 1977-81 aims to have nearly 90% of the national road system paved, and to begin to give greater emphasis to improvement of provincial roads (para. 2.21). In addition, it is intended to prepare a program for improving the maintenance of provincial and county (gun) roads, and to initiate planning for county roads and prepare a future project for their improvement. The Government also aims to further strengthen the MOCs capability for maintaining national roads, and to train further staff to replace losses. The object of the project is to assist the Government to achieve all these aims, concerning the entire road subsector, and is a logical extension of the previous three highway projects.

B. Description

3.02 The project consists of:

(a) construction and improvement, including paving, and supervision by consultants, of 36 sections of national roads totalling about 950 km;

(b) construction and improvement, including paving, and supervision by consultants, of 10 sections of provincial roads totalling about 280 km;

(c) procurement of additional road maintenance equipment for maintaining national roads;

(d) a study by consultants of provincial and county (gun) road planning, construction, maintenance, administration and financing, and of the institutions involved, and of gun road development to prepare an investment program, followed by further feasibility studies and detailed engineering of about 2,000 km; and

(e) provision of fellowships for training staff of the Government.

(a) Construction and Improvement, Including Paving, of National Roads

3.03 Thirty-six sections of national roads, totalling about 950 km, will be constructed and improved, including bituminous paving, generally following their present alignments, but with improvement of curves and widening of the roadway and shoulders, and the provision of adequate drainage. However, in a few cases realignment will be undertaken of continuous lengths up to a maximum of about 10 km where justified by shortening of the route length or to by-pass congested sections through villages. The roads, and their design standards, related to traffic volumes in accordance with Table 2.11, are listed in Table 3.1 and are described in more detail in Working Paper C-1, on the Project File. Their locations are indicated on the Map. All will have 2-lane pavements except for two sections of 4-lane pavement 4 km and 23 km long. The widths will vary, according to traffic volumes, with the 2-lane pavements between 6.20 m and 7.20 m wide and shoulders between 0.55 m and 1.90 m. Design speeds will vary according to terrain, normally between 40 km/h and 80 km/h. Maximum gradients will normally be below 7%, though some short sections in mountainous areas are up to 9%. Pavements will be of asphalt concrete and shoulders normally of gravel. New bridges will be constructed where necessary for reasons of alignment, hydraulic capacity, width, or structural strength.

(b) Construction and Improvement, Including Paving, of Provincial Roads

3.04 Ten sections of provincial roads, totalling about 280 km, will be constructed or improved, including 2-lane bituminous paving. The roads, and their design standards, related to volumes in accordance with Tables 2.11 and 4.1 are shown in Table 3.1 and they are described in more detail in Working Paper C-1. Widths and gradients are similar to national roads for equivalent traffic, but design speeds are usually slightly lower.

3.05 Feasibility studies and detailed engineering for items (a) and (b) above, have been completed under the Second Highway Project (Loan 956-KO) on 33 of the 36 sections of national roads included in the project (880 km out of 952 km) and on four of the ten provincial roads in the project (107 km out of 282 km), altogether 80% of the total length of the project roads. The feasibility studies and detailed engineering were carried out by US consultants Louis Berger International, in association with eight Korean consulting firms, between August 1975 and early 1978. The same firms carried out, in early 1978, a preliminary engineering and economic analysis on the remaining nine road sections and they are now carrying out detailed engineering and will prepare updated cost estimates and economic analyses, expected to be completed in early 1979. Copies of the bid documents and updated cost estimates and economic analyses for these nine road sections will be sent to the Bank for agreement before bids are invited; this was confirmed during negotiations.

(c) Provision of Additional Road Maintenance Equipment for Maintaining National Roads

3.06 Additional items of equipment will be procured, which have been found necessary for the MOC's field organization for maintaining national roads. It consists mainly of additional trucks, loaders, asphalt mixing and compaction equipment and some specialized equipment for bridge repairs, snow removal, and some additional stocks of spare parts. This equipment will complement that previously provided under the First and Second Highway Projects (para. 2.32).

(d) Study of Provincial and County (Gun) Road Maintenance and Institutions, and of Gun Road Development

3.07 The project includes a study of: (i) the institutions at national, provincial and county (Gun) levels concerned with planning, design, maintenance, construction and administration of provincial and gun roads, and of their financing; and (ii) development of the gun road system. Part (i) of the study will lead to proposals for the improvement of the institutions, including any reorganization found necessary, and for the improvement of provincial and gun road maintenance, together with cost estimates and a program and time schedule for implementation. Part (ii) of the study will lead to preparation of an outline tentative long-range program for improving gun roads, a five-year program of improvements of about 5,000 km of gun roads for inclusion in the Fifth Five-Year Plan, 1982-86, and after review and selection by the Government in agreement with the Bank, detailed preparation of a selected 2,000 km for improvement under a future project. Draft Terms of Reference covering these subjects were prepared by the appraisal mission. However, difficulty was encountered in having the Government review these, and decide on the arrangements for managing and executing the studies, since the MOHA presently lacks an organization to deal with works institutions and programs (para. 2.18).

3.08 The Government later confirmed that MOHA will be responsible for the studies and agreed to the Terms of Reference subject to minor changes which have been accepted by the Bank. During negotiations, the Government defined the arrangements to be made for management of the studies. These include proposals to create a new Local Road Section in the Local Development Bureau of the MOHA, with four engineers who will constitute the Government's counterpart staff for the studies and will participate in the Government's review of the findings and the formulation and implementation of action programs. Understanding was reached on the proposed arrangements, including a time schedule for setting up the Local Road Section and for appointing consultants and carrying out the studies (para 5.01(d)).

(e) Provision of Fellowships for Training Staff of the MOC

3.09 The project includes fellowships for a further nine staff members of the Government for overseas training for periods of up to one year in transportation economics and project evaluation, and in highway engineering, with particular reference to maintenance (para. 2.19).

C. Cost Estimates and Foreign Exchange Component

3.10 The cost of the project, including contingency allowances, is estimated at about US$378 million. The foreign exchange component is estimated at about US$143 million equivalent, or about 38%. The estimated costs are shown in Table 3.2, and are summarized below. The estimated average costs per km, excluding contingency allowances (including contingency allowances shown in parentheses) are: (a) for improvement and paving of roads, US$208,000 (US$263,000); (b) for supervision by consultants, US$2,200 (US$2,600); and (c) for studies and detailed engineering by consultants for improvement of gun roads, US$2,000 (US$2,400). The estimated costs per man-month, excluding contingency allowances, for the small nucleus of key staff provided by foreign consultants (paras. 2.28 and 3.13), excluding foreign and local travel and local subsistence allowances, for supervision of construction (about 90 mm) and the study of provincial and gun roads (about 50 mm) are US$7,500; including foreign and local travel and local subsistence allowances the costs per man month are US$9,700. The estimated costs for Korean consultants (about 600 mm excluding the detailed engineering of gun roads) excluding costs of travel and allowances are US$3,100 and including travel and allowances are US$3,600.

Project Element	Won (million) Local	Foreign	Total	US$ (million) Local	Foreign	Total	% Foreign Exchange Component
A. Construction and improvement of national roads	55,765	40,381	96,146	114.98	83.26	198.24	42
B. Construction and improvement of provincial roads	16,595	12,017	28,612	34.21	24.78	58.99	42
Subtotal A+B	72,360	52,398	124,758	149.19	108.04	257.23	42
C. Road maintenance equipment	582	1,843	2,425	1.20	3.80	5.00	75
D. Consultants' services:							
(i) supervision of A and B	882	437	1,319	1.82	0.90	2.72	33
(ii) Studies and engineering of provincial and gun roads	2,207	218	2,425	4.55	0.45	5.00	9
E. Fellowships for training staff of MOC	15	48	63	0.03	0.10	0.13	77
F. Contingency allowances:							
(i) Physical /a	7,605	5,494	13,099	15.68	11.33	27.01	
(ii) Price /b	12,343	8,921	21,264	25.45	18.38	43.83	
Subtotal F	19,948	14,415	34,363	41.13	29.71	70.84	
Total A - F	95,994	69,359	165,353	197.92	143.00	340.92	42
G. Right of Way	18,090	-	18,090	37.30	-	37.30	
Total Cost of Project	114,084	69,359	183,443	235.22	143.00	378.22	38

/a 10% on all items.

/b Price escalation assumed to be at annual rates of 7 1/2% in 1979 and 7% during each year thereafter for both local and foreign costs.

3.11 Cost estimates for construction and improvement, including paving, of 33 of the 36 sections of national roads, and of 4 of the 10 sections of provincial roads, were prepared by the consultants, Louis Berger International, in association with the eight firms of Korean consultants, after completing detailed engineering (para. 3.05), using unit prices for similar work obtained from competitive bidding on the Third Highway Project in early 1976, adjusted to cover increases in costs estimated to early 1979, when bids are expected to be invited. Cost estimates for the remaining three sections of national roads and six sections of provincial roads have been prepared by the same consultants on the basis of engineering reconnaissance and estimated approximate quantities of work and similar unit prices as for the other roads. Although detailed engineering has not yet been completed for 9 of the 46 sections of road, the cost estimates are considered satisfactory in view of: (a) the Government's and consultants' record of good estimating on previous projects; (b) only 20% of the roads not yet having detailed engineering completed; and (c) the engineering reconnaissance carried out on the remaining nine sections, together with the general similarity of the work to be undertaken. As noted in para 3.05, detailed engineering and final cost estimates for these 9 sections will be sent to the Bank before bids are invited.

3.12 The cost estimates for procurement of road maintenance equipment have been prepared by the MOC on the basis of additional needs assessed after about two year's experience since extending the MOC maintenance organization for national roads to the entire country, and on prices for units of equipment based on those received through international bidding on the equipment obtained under the Second Highway Project in 1975-76, updated to present estimated costs.

3.13 The cost estimates for consultants' services for supervision of construction and improvement, for the studies of provincial and gun roads, followed by detailed engineering of gun roads for future projects, are based on previous contracts with consultants for similar work, taking into account the revised mix of foreign and local firms and numbers of staff, and with costs updated to cover increases estimated to early 1979. The estimated costs of the consultants for supervision are unusually low as a proportion of the cost of construction, but this is because: (a) their services are only to assist the MOC, which is itself supplying most of the site supervisory staff for the contracts; and (b) most of the consultants' staff will be supplied by local consulting firms, with only a small nucleus of foreign staff. The scales of supervisory staff to be provided by both the consultants and the MOC were further reviewed and confirmed during negotiations. It was also confirmed during negotiations that the Government will employ consultants for supervision before awarding any works contracts.

3.14 Contingency allowances include 10% for physical quantities for work to be carried out, and for equipment and spare parts to be procured, and for price escalation at average annual rates of 7 1/2% in 1979 and 7% during each year thereafter, for both local and foreign costs. The cost estimates and contingency allowances are considered reasonable, and were reviewed and confirmed during loan negotiations.

3.15 The foreign exchange component of road construction and improvement, including paving, has been estimated by the consultants at about 53% when carried out by foreign contractors and about 42% when carried out by Korean contractors. Since all contracts on the First, Second and Third Highway Projects have been won by local firms, it is assumed that all contracts under this project will also be won by Korean contractors and the foreign exchange component for construction and improvement, including paving, has therefore been calculated at 42%. This is slightly lower than estimated under the Third Highway Project (45%), chiefly because of the substantial rise in local costs of labor which has taken place in the meantime, together with the gradually increasing proportion of local equipment and materials used. The foreign exchange component of the consultants' services has been calculated on the basis of the estimated numbers of man-months of foreign and local consultants' staff to be employed; it is estimated at 33% on supervision and only 9% on the studies and engineering, for which Korean consultants provide practically all the staff for carrying out the detailed engineering.

D. Financing

3.16 The total cost of the project is estimated at about US$378 million equivalent and the foreign exchange cost about US$143 million, which will be financed by the loan. The local cost of about US$235 million will be financed by the Government (Table 3.2). The Government provided promptly adequate funds for the First and Second Highway Projects, but for the Third Highway Project, for budgetary reasons, it initially extended by about a year the time for carrying out most of the construction contracts. However, at the beginning of 1978, the Government increased its budgetary provision and requested the contractors to accelerate the works to complete them approximately within the originally estimated construction periods. It was confirmed during loan negotiations that the Government will provide adequate and timely funds and make prompt payments under the project.

E. Implementation and Procurement

3.17 The MOC will be responsible for carrying out the project, through its BPR, as for the three previous highway projects, except for the studies of provincial and gun roads (paras. 3.07 and 3.08) for which the MOHA will be responsible. The MOC will be assisted in supervising the construction and improvement works by the same consultants who carried out the engineering (para. 3.05). The MOHA will be assisted by consultants in carrying out the studies of the institutions concerned with provincial and gun roads, and of their maintenance, and the detailed engineering of gun roads for preparation of future projects (para. 3.08). During negotiations, agreement was confirmed with the Government on the Terms of Reference for the studies, and on the employment of qualified and experienced consultants acceptable to the Bank, and on terms and conditions satisfactory to the Bank, to assist in supervising

the road construction and improvement works, and to carry out the studies and engineering of provincial and gun roads.

3.18 Road construction and improvement will be carried out through contracts awarded on the basis of international competitive bidding by prequalified firms in accordance with the Bank Group's "Guidelines for Procurement," and on the advice of consultants. Road maintenance equipment will be procured through contracts awarded after international competitive bidding, also in accordance with the "Guidelines for Procurement;" foreign bids will be evaluated on the c.i.f. (port of entry) cost, and local bids on the ex-factory cost, with a margin of preference equal to the import duties and taxes, up to a maximum of 15%, allowed to domestic manufacturers. These procedures were confirmed by the Government during negotiations.

3.19 An average of about 9,000 workers are expected to be directly employed on the construction and improvement works for an average contract period of 33 months. In carrying out the works, contractors are free to choose their own methods, including choice of equipment and labor, subject to works complying with performance specifications. This is in accordance with Government policy (para. 2.30), which is appropriate because: (a) the construction works are not of a kind suited to intensive hand labor methods; (b) there is no serious unemployment problem in Korea; and (c) there is no significant distortion in the market prices for labor, equipment, materials, etc. In regard to road maintenance, consultants will investigate appropriate work methods, including the mix of labor and equipment, as part of the study of provincial and gun road maintenance (para. 3.07).

3.20 The Government advertised internationally in June 1978 inviting contractors to prequalify. Bids for 37 of the 46 road sections are expected to be received in April 1979, and work is to start in June 1979. Bids on the remaining nine sections are expected to be received by June 1979 and work start in July 1979. All construction works are expected to be completed by early 1982. The studies and engineering of provincial and gun roads are expected to be started in July 1979 and be completed by early 1982. Allowing for final payments and disbursements, the closing date for the loan will be December 31, 1982. During negotiations, understanding was reached with the Government on a Project Implementation Schedule (Table 3.3) and on arrangements for reporting progress.

F. Environmental and Urban Aspects

3.21 The works have been designed to avoid causing any significant ecological problems. The alignments follow the existing roads as far as economically practicable, reducing land acquisition for right-of-way, and property disturbance, to a minimum. Also, some particularly congested villages and small towns will be by-passed where traffic conditions would

have been particularly dangerous, or major property demolition would have been involved. The new road surfaces will be paved, eliminating unpleasant conditions for traffic and for the population living near the road, due to dust in dry weather and mud during rainy periods. During negotiations, the arrangements for acquisition of land, and payment of compensation, for right-of-way were confirmed by the Government.

G. Disbursements

3.22 Disbursements from the loan will be made on the basis of:

(a) 42% of the total cost of construction and improvement;

(b) 100% of the c.i.f. cost of imported road maintenance equipment; or the ex-factory price, excluding identifiable taxes and duties, of locally manufactured equipment;

(c) 100% of the foreign exchange costs of consultants' services; and

(c) 100% of the foreign exchange costs of training of staff (through fellowships).

A Schedule of Estimated Disbursements (Table 3.4) has been prepared. The cost estimates for the project, the Schedule for Execution, and the Schedule of Estimated Disbursements were reviewed and agreed with the Government during negotiations.

4. ECONOMIC EVALUATION

A. General

4.01 This project will continue to assist Korea in improving and modernizing its road transport system. Its benefits are essentially a reduction of the high costs of moving goods and passengers, and provision of easier access to some isolated areas with high economic development potential.

4.02 Together with the ongoing Third Project, this project will help the Government in achieving its targets for road improvement during the FFYP (1977-81). The two projects will assist in financing about 50% of the national road paving program; 1,750 km out of 3,700 km. ADB will finance another 760 km, and the Government will fund the remaining 1,200 km entirely from its own resources. This project will also partially finance 60% of the provincial road paving program; 280 km out of 450 km. ADB is considering assistance for another 120 km, leaving 50 km for the Government to finance entirely on its own.

4.03 The project supports the Government's strategy of paving existing gravel roads, which still account for 40% of the national network, rather than constructing new high standard highways. Feasibility studies show that for most road sections, the optimum first stage of improvement is to pave the road largely on the present alignment, with only minimum improvement of sharp curves, including widening and the improvement of drainage. Standards in each case are related to traffic levels as explained in para 3.04 and Table 2.11. The lower cost of such work permits the paving of two or three times the length of road which could be newly constructed. However, there are some sections where factors, such as traffic volumes, inadequacy of present alignments, possibility of substantial shortening of the routes, justify immediate construction on new alignments. The present approach of minimizing and phasing investments, increases the feasibility of road projects and enables the highway system to meet a much larger total transport demand at lower cost; it follows the recommendations of the consultants and the Bank.

B. The Project Roads

Location

4.04 The project roads are scattered throughout the northern two thirds of the country with some concentration on the west coast and in the eastern mountains. Roads in the west will improve general transport and communications in a heavily populated agricultural area, and provide faster access to the provincial capital of Daejon. They will also enable fuller use of potential distance savings between the western coastal area and Seoul afforded by roadways built on new dams on the Asan Bay. Roads in the eastern mountains will reduce transport cost for coal and cement and improve the living conditions in these mining and industrial areas by enabling faster travel and reducing dust polution. The other project roads will improve access and transport within predominantly rural areas, which are presently isolated by the poor condition of existing roads. The economic setting and present traffic volumes for each project road are described in Working Paper C-1. The economic analysis of project roads was carried out by US consultants L. Berger. A feasibility study report was completed in December 1975, and the analysis was updated in the detailed engineering study completed in October 1977.

Traffic

4.05 The consultants' estimates of traffic assignment, volumes, and growth rates are based on regular MOC counts between 1965 and 1974. The consultants supplemented those by some 150 special counts in 1975, which was taken as the base year. They also performed origin-destination surveys for five roads where substantial diverted traffic was expected. Traffic on project roads ranged from 120 to 2,500 vehicles per day (aadt) in 1975, with a median aadt around 250 vehicles/day. The typical distribution of vehicles is 20% cars and taxis, 25% buses, and 55% trucks.

4.06 The traffic growth rates were based on macro-economic considerations and the same rates were applied to all roads. Growth in both passenger and freight traffic on the project roads were assumed to be lower than the corresponding national levels due to an expected lower than average growth of population and economic activity in the largely rural areas served.

Traffic Growth Rates
(in % p.a.)

	Cars and Taxis	Buses	Trucks
1975-90	11.1	7.0	7.5
1990-2001	13.0	5.5	6.0

Note: the opening year is 1982, and the economic life 20 years.

The generated traffic is expected to increase normal traffic by amounts ranging from 10% to 30% among the project roads. These increases are based on studies of earlier cases, where the elasticity of demand for road transport as a function of reduced operating costs was measured and on traffic counts following improvements. Traffic diversion from other roads will be significant for only five of the project roads. In 1982, the opening year, traffic on project roads is expected to range from 300 to over 5,000 vehicles/day, with a median over 500 vehicles/day (Table 4.1).

Benefits

4.07 Measureable benefits of the project are mainly in vehicle operating costs savings due to the improved conditions of the paved roads compared with the existing rough gravel roads. The consultants calculated vehicle operating costs as of July 1976 and later updated them to March 1977. Table 4.2 gives the estimated basic vehicle operating costs; Table 4.3 the range of these costs on project roads with and without the project. Vehicle operating costs on existing project roads are high; particularly in mountainous areas where terrain, alignment, and surface conditions slow traffic down to average speeds of 15 to 20 km/hr. The improvement to project roads in these areas will improve access, facilitating location of industry in the region as well as increasing the mobility of labor by enabling it to obtain employment over a wider area. The roads in isolated rural areas will stimulate the production of diversified crops as well as develop socio-economic contacts between the rural population and other parts of the country.

4.08 Improvement of project roads will reduce vehicle operating costs by 35% to 65%, for light vehicles and 45% to 75% for heavy vehicles. These reductions include time savings of drivers and assistants for commercial vehicles; taxis, buses and trucks. Time savings of passengers have been calculated separately. Since traffic benefits have been calculated assuming that roads without the project would remain in their present state, i.e. with a low level of maintenance, paving and upgrading results in a net maintenance cost rather than a benefit.

Economic Rates of Return

4.09 The economic rates of return (ERR) for the project roads, calculated over an assumed 20 years service life, range from 16% to over 40% excluding passenger time savings (Table 4.4). The weighted average ERR for all project roads which account for 96% of total project cost is 26%. This rate of return excludes investments in road maintenance equipment totalling 2% of project costs; and studies and training 2% of project cost. Passenger time savings increase ERR for individual roads by 2 to 4 percentage points. For the typical road, total benefits following paving would be distributed among various users as follows: cars and taxis less than 10%, buses about 40%, trucks over 50%. The proportion of benefits accruing to various users would gradually change over the project life as light vehicle traffic is expected to grow faster than bus and truck traffic. However, the shift would be very gradual, and trucks and buses would still account for 80% of the benefits towards the end of the assumed service life.

4.10 The construction of project roads will require an average of about 9,000 workers over a 33 month period, creating a total of about 300,000 man-months of employment, 60% of which for unskilled labor. The new pavements would bring also non-quantified benefits such as quicker and improved services and a reduction of heavy dust and mud which covers villages and fields along existing gravel roads which carry much traffic.

4.11 It is believed that the Government does not at present intend to levy tolls on any of the project roads and traffic has been forecast, and ERR's calculated, on that basis. The Government confirmed during negotiations that tolls will not be levied on any sections of roads to be constructed and improved under the project without first carrying out studies of the economic and financial effects, and reviewing the findings of the studies with the Bank.

C. Sensitivity Analysis and Risks

4.12 The sensitivity of the ERRs was tested for variations in project costs and benefits. Variations in costs and benefits affect the rates of return similarly. A 20% change in costs or benefits alters the ERR by 3 percentage points when the ERR is around 20%; by 4 points around 25% and 5 points around 30%. The weighted average rate of return of 26% would similarly change by less than 5 percentage points in a 20% variation in costs or benefits. The project is not subject to unusual risks. Costs are based on detailed engineering of 80% of the roads and the MOC and the consultants have extensive recent experience of similar works (para. 3.11). Benefits depend primarily on traffic which on average is already high and unlikely to vary greatly from projected trends.

5. AGREEMENTS AND RECOMMENDATIONS

5.01 During loan negotiations, the Government and the Bank agreed on a number of points, the principal ones being:

(a) the extension of collection and analysis of traffic data to the remainder of the provincial highway system by December 31, 1980 (para. 2.09);

(b) a review to be carried out by the Government of its licensing system for commercial road vehicles, with a view to introducing further relaxation of such commercial licensing (para 2.13);

(c) the maintenance of the national roads in line with an approved budget allocation for 1979 and an agreed target five-year forecast of maintenance budget requirements (paras 2.31 to 2.33);

(d) the arrangements being made by MOHA for carrying out the studies of the institutions concerned with provincial and gun roads, and of the maintenance of such roads, and of the development of the gun road system; (para 3.08);

5.02 The project is suitable for a Bank loan of US$143 million (representing about 38% of the total cost) for a period of 17 years, including a grace period of 4 years.

ANNEX 1

KOREA

FOURTH HIGHWAY PROJECT

Supporting Tables and Charts

Tables

Charts

KOREA

FOURTH HIGHWAY PROJECT

Traffic Statistics 1966 to 1977 Actual and 1981 Forecast

Freight

	Actual								Forecast		
	1966	%	1971	%	AAGR/a 66-71 % p.a.	1976	%	AAGR 71-76 % p.a.	1977	1981	%	AAGR 76-81 % p.a.
Tons (million)												
Railway	24	41	32	22	5.9	44	18	6.6	47	62	16	7.1
Highway	33	56	102	70	25.0	188	76	13.0	236	302	78	10.0
Public	(25)		(74)		(24.0)	(94)		(4.9)	(107)	(151)		(10.0)
Private and Govt.	(8)		(28)		(29.0)	(94)		(27.4)	(129)/b	(151)/c		(10.0)
Coastal	2	3	11	8	40.0	14	6	4.9	16	25	6	12.3
Total	59	100	145	100	19.7	246	100	11.1	311	389	100	9.6
Ton-km (billion)												
Railway	5.4	78	7.8	47	7.6	9.7	45	4.5	10.5	13.9	40	7.0
Highway	.8	12	4.0	24	38.0	6.6	30	10.5	8.1	11.4	33	11.5
Public	(0.6)		(3.3)			(4.4)		(5.9)	(5.1)	(7.6)		(11.5)
Private and Govt.	(0.2)		(0.7)			(2.2)		(25.7)	(3.0)/b	(3.8)/c		(11.5)
Coastal	0.7	10	4.7	29	46.0	5.5	25	3.2	6.3	9.4	27	11.4
Total	6.9	100	16.5	100	19.0	21.8	100	5.7	24.9	34.7	100	9.8

/a AAGR: Average Annual Growth Rate.
/b Estimated on the basis of number of registered trucks.
/c Estimated using the same growth rate as for public transport since no forecasts are available. The figure is likely to be low in view of the very rapid growth in 1977.

Source: Ministry of Transport, Statistics Year book of Transportation 1977 (M.O.T.), FFYP 1977-81, and mission's estimates.

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Table 1.1

KOREA

FOURTH HIGHWAY PROJECT

Traffic Statistics 1966 to 1977 Actual and 1981 Forecast

Passengers

	Actual									Forecast		
	1966	%	1971	%	AAGR/a 66-71 % p.a.	1976	%	AAGR 71-76 % p.a.	1977	1981	%	AAGR 76-81 % p.a.
Passengers (million)												
Railway	138	8	128	4		288	5	-	348	433	5	-
Intercity	(138)	-	(128)	-	-1.5	(149)	-	3.1	(162)	(178)	(2)	3.6
SMESRS/b	-	-	-	-		(134)	-	-	(186)	(265)	(3)	14.6
Highway	1,512	91	3,024	96	-	5,051	95	-	5,931	7,769	95	-
Intercity	(272)	(16)	(333)	(11)	4.1	(652)	(12)	14.4	(803)	(792)	(10)	4.0
Urban	(1,240)	(75)	(2,691)	(85)	16.8	(4,399)	(83)	10.3	(5,128)	(6,977)	(85)	9.7
Coastal	6	1	6	<1	-	6	<1	-	7	7	<1	-
Aviation	-	-	1	<1	-	1	<1	-	1	2	<1	-
Total	1,656	100	3,159	100		5,341	100		6,287	8,221	100	
Passenger-km (billion)												
Railway	8.7	43	8.8	27	0.0	14.7	25	-	17.6	20.4	22	-
Intercity	(8.7)	-	(8.8)	-	-	(12.4)	(21)	7.1	(14.6)	(16.5)	(18)	5.9
SMESRS/b	-	-	-	-	-	(2.3)	(4)	-	(3.1)	(3.9)	(4)	11.1
Highway	11.5	56	22.9	71	14.8	43.4	74	-	50.7	71.6	77	-
Intercity	N.A.		(11.6)	(36)	N.A.	(25.0)	(43)	16.6	N.A.	(42.4)	(46)	11.1
Urban	N.A.		(11.3)	(35)	N.A.	(18.4)	(31)	10.2	N.A.	(29.2)	(31)	9.7
Coastal	0.2	1	0.3	1	-	0.2	<1	-	0.3	0.4	<1	-
Aviation	0.1	-	0.3	1		0.3	<1	-	0.4	0.6	<1	-
Total	20.5	100	32.3	100		58.6	100		69.0	93.0	100	

/a AAGR: Average Annual Growth Rate.
/b SMESRS includes Traffic on KNR Seoul Suburban lines as well as Seoul City Subway.

Source: Ministry of Transport, Statistics Yearbook of Transportation 1977 (M.O.T.), and mission's estimates. The 1981 figures are those included in the Fourth Five-Year Plan 1977-81 except for railway where the revised KNR/mission estimates are shown. FFYP figures for railway were 458 million passengers and 19 billion pass-km.

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Table 1.2

KOREA

FOURTH HIGHWAY PROJECT

Total Transport Investment - Third Plan
(1972-76) and Fourth Plan (1977-81)
(Billion Won in 1975 prices)

Modes		1972-76 Actual		1977-81 Planned	
Roads	(Public)	(237)	833	(458)/a	1,226
	(Private)	(596)		(768)	
Railways			318		402
Ports and Marine	(Public)	(130)		(251)	
	(Private)	(412)	522	(745)	996
Air Transport			122		59
Seoul Subway			57		101
Others			5		-
Total Transport Investment			1,857		2,784
Total Capital Expenditure			11,996		19,028
Transportation as % of Total			15.7%		14.6%

/a Details are given in Table 2.8.

Source: EPB.

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KOREA

FOURTH HIGHWAY PROJECT

Public Roads Network 1962-1977 /a

Years	National roads/b			Provincial roads			Gun roads		
	Paved	Gravel	Total	Paved	Gravel	Total	Paved	Gravel	Total
First FYP									
1962	857	4,886	5,743	73	10,470	10,543	-	-	10,000 /c
1963	863	4,947	5,810	54	11,244	11,298	-	-	n.a
1964	963	4,936	5,899	54	11,343	11,397	-	-	n.a.
1965	1,042	4,857	5,899	71	12,267	12,338	-	-	n.a.
1966	1,349	6,837	8,186	31	10,364	10,395	-	-	n.a
Second FYP									
1967	1,442	6,744	8,186	52	10,600	10,652	-	-	n.a
1968	1,540	6,626	8,166	74	10,597	10,671	-	-	n.a
1969	2,110	6,461	8,571	134	10,703	10,837	-	-	n.a
1970	2,461	6,197	8,658	202	10,692	10,894	-	-	n.a
1971	2,943	5,843	8,786	254	10,524	10,774	-	-	n.a
Third FYP									
1972	3,319	5,610	8,929	283	10,517	10,800	-	-	n.a
1973	3,868	5,419	9,287	503	10,389	10,892	-	-	n.a
1974	4,070	5,217	9,287	639	10,250	10,889	-	-	n.a.
1975	4,748	4,612	9,360	719	10,092	10,811	-	-	n.a
1976	4,874	4,486	9,360	811	10,057	10,868	-	-	n.a
Fourth FYP									
1977	5,434	4,008	9,442	922	9,933	10,855	384	12,125	12,509
	58%	42%	100%	8%	92%	100%	3%	97%	100%

/a In addition there are 12,900 km of City roads (mostly streets), 7,500 km in the special cities of Seoul and Busan, and 5,400 km in all other cities; and also about 47,000 km of village access roads of which about 36,000 km had been constructed and improved under the Saemaul Movement at the end of 1977.

/b Includes roads under the jurisdiction of KHC, totalling 1,225 km in 1977.

/c Length not available (n.a.) before 1977 as city roads were tabulated jointly with gun roads. Length of gun roads in 1962 believed to have been about 10,000 km.

Source: Ministry of Construction.
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KOREA

FOURTH HIGHWAY PROJECT

Registered Motor Vehicles, 1962-1977

Years	Cars /a	Trucks /b	Buses /c	Motorcycles	Others /d	Total
First FYP						
1962	8,733	13,093	6,747	-	2,241	30,814
1963	9,569	13,929	8,132	-	2,598	34,228
1964	11,409	14,951	8,617	-	2,836	37,813
1965	13,001	16,015	9,316	-	3,179	41,511
1966	17,502	19,432	10,888	-	2,338	50,160
Second FYP						
1967	23,235	22,955	11,499	1,186	1,822	60,697
1968	33,112	31,582	12,786	1,378	2,093	80,951
1969	50,299	40,134	14,237	1,675	2,324	108,669
1970	60,677	48,901	15,831	2,711	1,251	129,371
1971	67,582	53,405	17,411	3,902	2,037	144,337
Third FYP						
1972	70,244	55,116	17,550	4,216	2,909	150,035
1973	78,334	64,584	18,871	5,407	3,518	170,714
1974	76,462	76,833	20,060	6,039	4,150	183,544
1975	84,212	82,862	21,818	6,594	5,035	200,521
1976	96,099	93,885	23,643	7,342	5,351	226,320
Fourth FYP						
1977	125,613	118,150	26,710	7,440	4,839	282,752
			Average Annual Growth (% p.a.)			
1962-67	21.7	11.9	11.3	-	-	14.5
1967-72	24.8	19.2	8.8	19.6	-	19.8
1972-77	12.3	16.4	8.8	12.0	-	13.5
1976-77	30.7	25.9	13.0	1.3	-	24.9
			Fleet composition (%)			
1962	28.3	42.5	21.8	--- 7.4 ---		100
1967	38.3	37.8	18.9	2.9	2.1	100
1972	46.8	36.9	11.7	2.8	1.8	100
1977	44.4	41.8	9.5	2.6	1.7	100

/a Includes taxis and Government vehicles (see details p. 2).
/b Includes public carriers as well as private and government-owned trucks (see details, p.3).
/c Includes microbuses (673 in 1976).
/d Public service and special vehicles, includes motorcycles prior to 1967.

Source: Ministry of Transportation.

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Cars by Categories of Ownership
('000 vehicles)

Years	Government	Private	Commercial (mostly taxis)	Total
Second FYP				
1967	2.2	9.9	11.1	23.2
1968	2.8	14.4	15.9	33.1
1969	3.1	23.7	23.5	50.3
1970	3.6	28.7	28.4	60.7
1971	4.0	34.0	29.6	67.6
Third FYP				
1972	4.5	36.4	29.3	70.2
1973	5.0	43.4	29.9	78.3
1974	4.9	44.6	27.0	76.5
1975	5.0	50.1	29.1	84.2
1976	5.2	61.6	29.3	96.1
Fourth FYP				
1977	5.4	85.6	34.6	125.6
		Fleet Composition (%)		
1967	9.5	42.7	47.8	100
1972	6.4	51.9	41.7	100
1977	4.3	68.2	27.5	100
		Cars per 1,000 Population		
	Population million	Private/'000		Total/'000
1967	30.1	0.19		0.76
1972	32.5	0.55		1.64
1977	36.0	1.93		3.28

Source: Statistics Yearbook of Transportation 1977, Ministry of Transportation and mission estimates for 1977.

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Trucks by Categories of Ownership
('000 vehicles)

Year	Government	Private /a	Commercial /b	Total
Second FYP				
1967	2.2	5.6	15.1	23.0
1968	2.7	7.6	21.3	31.6
1969	2.8	11.0	26.3	40.1
1970	3.0	15.2	30.7	48.9
1971	3.3	18.5	31.6	53.4
Third FYP				
1972	3.6	21.5	30.0	55.1
1973	4.9	26.8	32.9	64.6
1974	4.9	45.3	36.6	76.8
1975	5.0	39.9	38.0	82.9
1976	5.9	49.4	38.6	93.9
Fourth FYP				
1977	6.5	69.5	42.2	118.2
		Fleet Composition (%)		
1967	10.0	24.3	65.7	100
1972	6.5	39.0	54.5	100
1977	5.5	58.8	35.7	100

/a For carrying own goods.

/b Common carriers.

Source: Statistics Yearbook of Transportation 1977, Ministry of Transportation and mission estimates for 1977.

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KOREA

FOURTH HIGHWAY PROJECT

Korean Motor Vehicle Production, 1962-1977

Year	Cars	Trucks /a	Buses	Motorcycles	Total
Actual					
First FYP					
1962	991	42	884	-	1,917
1963	1,430	233	143	-	1,806
1964	179	405	108	-	692
1965	166	1,251	965	-	2,382
1966	3,398	1,482	559	-	5,439
Second FYP					
1967	5,033	941	1,512	4,591	12,077
1968	11,421	1,632	5,212	16,569	34,834
1969	10,727	1,884	9,626	13,735	35,972
1970	13,636	3,690	13,032	16,242	46,600
1971	11,870	3,059	8,072	12,317	35,318
Third FYP					
1972	9,577	2,568	6,506	773	19,424
1973	12,130	3,400	10,176	13,851	39,557
1974	9,247	3,398	19,808	11,495	43,948
1975	17,862	3,837	18,168	11,666	51,533
1976	25,304	3,481	20,312	16,798	65,895
Fourth FYP					
1977	35,268	5,441	34,394	32,629	107,732
Planned /b					Total excluding motorcycles
1978	74,000	7,000	49,000	n.a.	130,000
1979	110,000	5,000	49,300	n.a.	164,600
1980	179,000	5,900	59,000	n.a.	243,900
1981	250,000	6,400	73,100	n.a.	329,500

/a Includes three-wheel vehicles; three-wheel vehicles have not been produced in Korea since 1974.

/b The installed annual capacity of the Korean Motor Vehicle Industry in early 1978 was: cars 139,000; buses 14,400; trucks 51,600.

Source: Ministry of Transportation and Ministry of Commerce and Industry.

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KOREA

FOURTH HIGHWAY PROJECT

Motor Vehicle Fuel Consumption, 1962-1977 /a
(1,000 kiloliters)

Year	Gasoline	Diesel
First FYP		
1962	180	225
1963	97	358
1964	102	386
1965	223	507
1966	336	558
Second FYP		
1967	481	765
1968	573	1,251
1969	748	1,507
1970	865	1,775
1971	992	2,099
Third FYP		
1972	976	2,338
1973	1,040	2,838
1974	698	2,918
1975	664	3,328
1976	838	4,103
Fourth FYP		
1977	1,105	4,767
Average Annual Growth (% p.a.)		
1962-67	21.7	27.8
1967-72	15.2	25.4
1972-77	2.5	15.3
1976-77	31.9	16.2

/a Gasoline consumption is totally for vehicles, but diesel consumption includes 20-30% of other consumption.

Source: Ministry of Commerce and Industry.

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KOREA

FOURTH HIGWAY PROJECT

Commercial Licensing of Motor Vehicles

Year	Taxis			
	Number of companies	Number of vehicles	Owner-drivers	Total taxis
1974	669	27,000	-	27,000
1976	711	28,240	860	29,100
1977	722	29,830	4,770	34,600

	Trucks					
	Area license		Route license		Total	
	Number of companies	Trucks ('000)	Number of companies	Trucks ('000)	Number of companies	Trucks ('000)
1974	n.a.	n.a.	n.a.	n.a.	674	36.6
1976	725	37.0	32	1.6	757	38.6
1977	740	40.6	32	1.6	772	42.2

	Buses							
	Intracity		Intercity /a		Charter		Total	
	Number of co.	Buses ('000)	Number of co.	Buses ('000)	Number of co.	Buses ('000)	Number of co.	Buses ('000)
1974	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	341	16.5
1976	199	9.5	144	8.7	93	1.3	436	19.5
1977	204	10.2	150	9.5	108	1.9	462	21.6

/a Include 11 companies operating services on the expressways.

Source: MOT

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KOREA

FOURTH HIGHWAY PROJECT

Road Authorities and Agencies

	Toll Highways	National Roads	Provincial Roads/a	City/County (Gun) Roads
Planning	MOC	MOC	9 Provincial Construction Bureaus (PCB)/b	City/County Construction Sections (CCS)
Construction				
Design and Supervision	MOC/Korea Highway Corporation (KHC)	MOC, through its 9 Territorial Construction and Management Offices (TCMO's)	PCB /b	CCS
Financing	MOC/KHC /c	MOC	Provinces with Ministry of Home Affairs (MOHA) grants; also from MOC budget for special projects	City/County with Provincial grants
Maintenance				
Execution Authority/ Agency				
Paved	KHC	MOC /d	PCB	CCS
Unpaved	-	PCB	PCB	CCS
Financing	KHC	MOC	Provinces with MOHA grants	City/County with Provincial grants

/a The Special Cities of Seoul and Busan (City Construction Bureaus) have functions similar to Provincial Authorities (Provincial Construction Bureaus).

/b The MOC has so far handled the planning, design and supervision of construction or major improvement of a number of provincial roads, particularly those for which external financing is involved.

/c KHC was established in January 1969, but has not so far financed any construction.

/d MOC has responsibility for maintenance of all national roads; it directly maintains paved national roads through its 19 National Highway Maintenance Offices (NHMO's) under its 9 Territorial Construction and Management Offices (TCMO's); it delegates maintenance of the unpaved national roads to the provinces (PCBs) with financial grants from the MOC's budget, and assistance provided by its TCMO's.

Source: Ministry of Construction

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Table 2.7

KOREA

FOURTH HIGHWAY PROJECT

Expenditures on Roads, 1962-76 /a
(Million won)

	Total First Plan 1962-66	%	Total Second Plan 1967-71	%	Total Third Plan 1972-76	%
Government Expenditures on National Highways /b						
Administration	74	1	946	1	5,887	2
Construction	3,811	53	89,022	72	179,424	66
Maintenance /c	193	3	1,448	1	11,479	4
Subtotal	4,078	57	91,416	74	196,790	72
Expenditures on Provincial, gun (County), and city Roads /d /e						
Construction	2,174	31	26,286	21	65,150	24
Maintenance /f	851	12	5,737	5	11,516	4
Subtotal	3,025	43	32,023	26	76,666	28
Total	7,103	100	123,439	100	273,456	100

/a At current prices.
/b Includes roads under the jurisdiction of KHC.
/c Does not include funds contributed by provinces for the maintenance of national highways.
/d Seoul City excepted.
/e Includes Government grants.
/f Maintenance includes expenditures on national highways, estimated up to 70% of the total but does not include the value of voluntary labor provided for all highways.

Source: Ministry of Construction, Ministry of Home Affairs.

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Table 2.8

KOREA

FOURTH HIGHWAY PROJECT

Fourth Five Year Plan Expenditures for Roads
(in 1975 prices)

	1977	1978	1979	1980	1981	Total		
	(W billion)					W billion	US$ million	km
Central Government Financing								
A. Construction and Improvement								
National Highways								
Paving	31.0	38.4	35.3	36.8	45.6	187.1	385.8	3,734
Widening	0.9	0.9	2.3	2.3	3.4	9.8	20.2	67
KHC roads	11.3	0.4	9.3	9.2	-	30.2	62.3	128
Provincial roads								
paving	2.9	3.6	5.1	6.7	8.6	26.9	55.5	453
Industrial roads	4.2	6.3	6.7	7.6	7.2	32.0	66.0	n.a.
Bridges (length in m)	1.7	1.4	0.2	0.3	1.5	5.1	10.5	5,019 m
Subtotal construction	52.0	51.0	58.9	62.9	66.3	291.1	600.3	
B. Other								
National Highway Maintenance /a	10.3	13.1	13.1	13.2	14.5	64.2	132.4	
Studies	0.5	0.5	0.5	0.5	0.5	2.5	5.2	
Subtotal Central Govt	62.8	64.6	72.5	76.6	81.3	357.8	737.9	
Local Government Financing (incl.maintenance)	16.4	18.0	19.8	21.8	24.0	100.0	206.1	
Total	79.2	82.6	92.3	98.4	105.3	457.8	944.0	

/a Excluding maintenance expenditures of KHC.

Source: Ministry of Construction

November 1978

Table 2.9

KOREA

FOURTH HIGHWAY PROJECT

Expenditures on Roads 1977
(W million)

	MOC /a	KHC /b	Local Government /c	Total
Expressways				
Administration	440	962		1,402
Construction	15,767	2,830		18,597
Maintenance	1,981	3,968		5,949
Total	18,188	7,760		25,948
National Highways				
Administration	6,146		210	6,356
Construction	57,425		5,148	62,573
Maintenance	5,953		1,068	7,021
Total	69,524		6,426	75,950
Provincial Roads				
Administration	38		531	569
Construction	2,868		7,660	10,528
Maintenance	-		1,166	1,166
Total	2,906		9,357	12,263
Gun and City Roads				
Administration			172	172
Construction			30,374/e	30,374
Maintenance			1,393	1,393
Total			31,939	31,939
Special City Roads /d				
Administration			1	1
Construction			66,656	66,656
Maintenance			1,936	1,936
Total			68,593	68,593
Total				
Administration	6,624	962	914	8,500
Construction	76,060	2,830	109,838	188,728
Maintenance	7,934	3,968	5,563	17,465
Total	90,618	7,760	116,315	214,693

/a Ministry of Construction.
/b Korea Highway Corporation.
/c Nine Provincial Governments and two Special Cities.
/d Seoul Special City and Busan Special City.
/e Of which 20,000 million were spent by one province Cholla-Nam Do.

Source: Ministry of Construction.

November 1978

KOREA

FOURTH HIGHWAY PROJECT

Road User Charges, 1967-78
(W Million)

Revenue	Second FYP					Third FYP					Fourth FYP	
	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978/a
National taxes												
Fuel taxes	4,048	9,680	12,791	16,959	29,083	27,717	36,582	83,717	95,016	114,874	133,082	114,712
Gasoline tax	(2,687)	(6,796)	(9,365)	(12,185)	(21,185)	(19,593)	(25,821)	(57,236)	(60,026)	(72,185)	(94,149)/b	(97,823)/b
Diesel tax	(1,361)	(2,884)	(3,426)	(4,774)	(7,898)	(8,124)	(10,761)	(26,481)	(34,990)	(42,689)	(38,933)/b	(16,889)/b
Transport tax	4,025	5,581	8,387	12,238	14,641	16,000	18,801	13,484	16,868	21,262	15,054/c	-
Commodity tax/d	669	1,075	2,158	5,060	4,465	3,535	6,613	7,499	11,764	16,642	9,330/c	-
Subtotal	8,742	16,336	23,336	34,257	48,189	47,252	61,996	104,700	123,648	152,778	157,466	114,712
Local taxes												
Vehicle tax (incl. surcharge)	1,500	2,488	3,869	5,606	6,393	7,191	7,866	12,016	12,353	14,137	17,900	20,600
License fee/e	250	584	881	1,165	1,799	1,661	1,084	1,784	2,092	2,388	3,949	5,100
Acquisition tax/e							1,622	2,643	3,708	4,636	6,143	8,000
Subtotal	1,750	3,072	4,750	6,770	8,192	8,852	10,572	16,443	18,153	21,161	27,992	33,700
Tolls	-	6	459	1,987	3,498	4,995	6,276	6,887	10,189	14,531	17,915	22,010
Total	10,492	19,414	28,545	43,014	59,879	61,099	78,844	128,030	151,990	188,470	203,373	170,422

/a Estimated.
/b Special excise tax excluding Value Added Tax (VAT).
/c These taxes were incorporated in the newly adopted Value Added Tax from July 1, 1977 when the Korean Tax system was changed.
/d Estimated 10% of total commodity tax.
/e Revenues were combined prior to 1973. Both license fee and acquisition tax figures are estimates of the portion of the revenues from these taxes attributable to road vehicles.

Sources: Ministry of Construction, Ministry of Finance, Ministry of Home Affairs.
November 1978

Table 2.10

KOREA

FOURTH HIGHWAY PROJECT

Design Standards (Rural) for Two-Lane National, Provincial and County (Gun) Roads

A. Construction (inluding paving, mainly on new alignment): National Roads

Geometric Design Standards	Unit	Terrain: Flat	Rolling	Hilly	Mountainous /a
Design speed	km/h	120	100	70	50
Minimum radius of curvature	m	630	390	170	80
Maximum gradient	%	4	5	7	8

Roadway Features (all areas)	Unit	
Width of pavement	m	7.20
Width of shoulders	m	3.00-1.75
Width of right-of-way	m	30 minimum /b

Structural Design Features (all areas)		
Axle-load (pavement)	lbs	18,000 /c
Bridge loading	-	DB-18, equivalent to AASHO H20-S16
Bridge widths (for new bridges) (over 100 m long)/d	m	10.70 (curb to curb)
Vertical clearance (over roads)	m	4.80

B. Paving (mainly on existing alignment, with limited improvement) National, Provincial and County Roads

Geometric Design Standards	Unit	Terrain: Flat Nat.	Flat Prov.	Flat Coun.	Rolling to Hilly Nat.	Rolling to Hilly Prov.	Rolling to Hilly Coun.	Mountainous /a Nat.	Mountainous /a Prov.	Mountainous /a Coun.
Design speed	km/h	80	60	60	60	50	40	40	30	30
Minimum radius of curvature:										
Desirable	m	300	140	140	175	95	60	80	35	35
Minimum	m	230	120	120	120	80	50	50	30	30
Maximum gradient	%	6	6	6	7	7	7	9	9	9
Desirable	%	4	4	4	5	5	5	7	7	7

Roadway Features (all areas)(m)	Unit	Traffic levels aadt (estimated 10 years after completion of paving): Under 1,200 Type A	1,200-2,200 Type B	Over 2,200 Type C
Width of pavement	m	6.20	6.70	7.20
Width of shoulders	m	0.55-0.90	1.40-0.65	1.90-1.15
Width of right-of-way /e	m	25	25	25

Structural Design Features (all areas)	Unit	
Axle-load (pavement)	lbs	18,000/c
Bridge loading	-	DB-18, equivalent to AASHO H20-S16
Bridge widths (for new bridges)/f		
Rural areas	m	8.50 (curb to curb)
Urban areas	m	10.00 (curb to curb)
Vertical clearance (over roads)	m	4.80

/a Design speeds and widths may be reduced and gradients increased on sections with exceptionally difficult terrain, as appropriate to each case.

/b Right-of-way width increased to 42 m where designed to accommodate ultimate construction of 4-lane divided highway.

/c Pavement designed for the projected number of repetitions of "equivalent 18,000 lbs axle-loads."

/d Depending on traffic volumes.

/e Right-of-way width reduced to 20 m where necessary to minimize demolition of property in urban areas.

/f Existing bridges retained unless significantly substandard in strength, size, or alignment.

Source: Ministry of Construction.

November 1978

KOREA

FOURTH HIGHWAY PROJECT

Design Standards on Project Roads

Project road section	Length km	Design standards /a: Type /b	Width: Pavement (m)	Width: Shoulders (m)
A. Construction and Improvement of National Roads				
1. Ssangyong-Seoghang	36	10 km Paving Type C	7.20	1.40
		26 km Paving Type A	6.20	0.90
2. Yongdu-Hongcheon	23	18 km Paving Type B	6.70	1.40
		5 km Paving Type A	6.20	0.90
3. Daegu-Gasan	19	4 km Paving 4-lane	14.00	1.00
		15 km Paving Type C	7.20	1.90
4. Anjung-Pyeongtaeg	16	km Paving Type C	7.20	1.90
5. Sintanjin-Cheongju	20	km Paving Type B	6.70	1.40
6. Yeongju-Bonghwa	18	km Paving Type B	6.70	1.40
7. Naedeog-Sodo	23	19 km Paving Type A	6.20	0.90
		4 km Paving Type A	6.20	0.55
8. Nonsan-Daejeon	32	km Paving Type B	6.70	1.40
9. Hangyeryeong-Yangyang	28	km Paving Type A	6.20	0.90
10. Bonghwa-Hyeondong	28	km Paving Type A	6.20	0.90
11. Bangrim-Jangpyeong	21	km Paving Type B	6.70	1.40
12. Gongju-Jeoneui	29	km Paving Type A	6.20	0.90
13. Weontong-Hangyeryeong	19	km Paving Type A	6.20	0.90
14. Daecheon-Machi	37	12 km Paving Type B	6.70	1.40
		16 km Paving Type A	6.20	0.90
		9 km Paving Type A	6.20	0.55
15. Seocheon-Buyeo	35	20 km Paving Type A	6.20	0.90
		15 km Paving Type B	6.70	1.40
16. Nogcheon-Yesan	21	km Paving Type A	6.20	0.90
17. Mungog-Bangrim	35	km Paving Type A	6.20	0.90
18. Gijisi-Sinryeweon	27	km Paving Type B	6.70	1.40
19. Sogcho-Daejin	39	5 km Paving Type B	6.70	1.40
		34 km Paving Type A	6.20	0.90
20. Sinnam-Inje	16	km Paving Type B	6.70	1.40
21. Yuseong-Gongju	17	8 km Paving Type A	6.20	0.90
		9 km Paving Type A	6.20	0.55
22. Chuncheon-Hwacheon	26	km Paving Type A	6.20	0.90
23. Machi-Gongju	28	8 km Paving Type B	6.70	1.40
		20 km Paving Type A	6.20	0.90
24. Goesan-Salmi	26	3 km Paving Type A	6.20	0.90
		23 km Paving Type C	7.20	1.90
25. Dongdae-Nogcheon	23	5 km Paving Type A	6.20	0.90
		18 km Paving Type B	6.70	1.40
26. Anseong-Janghoweon	38	km Paving Type A	6.20	0.90
27. Seosan-Gijisi	33	23 km Paving Type A	6.20	0.90
		10 km Paving Type B	6.70	1.40
28. Yongsan-Boeun	33	31 km Paving Type A	6.20	0.90
		2 km Paving Type A	6.20	0.55
29. Yeongcheon-Gono	29	23 km Paving Type A	6.20	0.90
		6 km Paving Type A	6.20	0.55
30. Hyeondong-Jangseong	29	19 km Paving Type A	6.20	0.90
		10 km Paving Type A	6.20	0.55
31. Seoghang-Naedeog	27	23 km Paving Type A	6.20	0.90
		4 km Paving Type A	6.20	0.55
32. Manripo-Taean	15	km Paving Type A	6.20	0.90
33. Janghoweon-Moggye	24	km Paving Type B	6.70	1.40
34. Gono-Euiseong	33	km Paving Type A	6.20	0.90
35. Miweon-Goesan	26	km Paving Type A	6.20	0.90
36. Gyeongju-Pohang	23	km Paving 4-lane	14.40	3.00
B. Construction and Improvement of Provincial Roads				
1. Balan-Suweon	15	km Paving Type C	7.20	1.90
2. Onyang-Asan Bay-Anjung	30	km Paving Type B	6.70	1.40
3. Ungcheon-Guryeong	29	26 km Paving Type A	6.20	0.90
		3 km Paving Type A	6.20	0.55
4. Yecheon-Yeongju	26	km Paving Type B	6.70	1.40
5. Cheongju-Jincheon-Gwanghaeweon	46	16 km Paving Type C	7.20	1.90
		13 km Paving Type B	6.70	1.40
		17 km Paving Type A	6.20	0.90
6. Yangsu-Daeseong	14	km Paving Type A	6.20	0.90
7. Anjung-Balan	20	km Paving Type C	7.20	1.90
8. Gwanghaeweon-Yangji	39	km Paving Type A	6.20	0.90
9. Gimcheon-Seonsan	21	km Paving Type A	6.20	0.90
10. Toegyeweon-Ildong	42	km Paving Type A	6.20	0.90

/a Standards described in detail in Table 2.11.

/b Pavements are all of asphalt concrete (AC).

Source: Ministry of Construction and Consultants.

November 1978

Table 3.2

KOREA

FOURTH HIGHWAY PROJECT

Estimated Cost of Project

Item	Length (km)	Local (W million)	Foreign (W million)	Total (W million)	Local (US$ million)	Foreign (US$ million)	Total (US$ million)	% F.E. component
A. Construction & Improvement of National Roads								
1. Ssangyong-Seoghang	36	2,329	1,686	4,015	4.80	3.48	8.28	
2. Yongdu-Hongcheon	23	1,286	931	2,217	2.65	1.92	4.57	
3. Daegu-Gasan	19	1,567	1,134	2,701	3.23	2.34	5.57	
4. Anjung-Pyeongtaeg	16	1,126	816	1,942	2.32	1.68	4.00	
5. Sintanjin-Cheongju	20	1,213	879	2,092	2.50	1.81	4.31	
6. Yeongju-Bonghwa	18	999	723	1,722	2.06	1.49	3.55	
7. Naedeog-Sodo	23	1,724	1,249	2,973	3.55	2.58	6.13	
8. Nonsan-Daejeon	32	2,307	1,670	3,977	4.75	3.45	8.20	
9. Hangyeryeong-Yangyang	28	1,461	1,058	2,519	3.01	2.18	5.19	
10. Bonghwa-Hyeondong	28	2,007	1,453	3,460	4.14	3.00	7.14	
11. Bangrim-Jangpyeong	21	1,050	761	1,811	2.17	1.57	3.74	
12. Gongju-Jeoneui	29	1,273	922	2,195	2.63	1.90	4.53	
13. Weontong-Hangyeryeong	19	1,098	795	1,893	2.26	1.64	3.90	
14. Daecheon-Machi	37	1,874	1,357	3,231	3.86	2.80	6.66	
15. Seocheon-Buyeo	35	1,083	1,305	3,108	3.72	2.69	6.41	
16. Nogcheon-Yesan	21	956	692	1,648	1.97	1.43	3.40	
17. Mungog-Bangrim	35	1,886	1,365	3,251	3.89	2.81	6.70	
18. Gijisi-Sinryeweon	27	1,910	1,384	3,294	3.94	2.85	6.79	
19. Sogcho-Daejin	39	1,792	1,298	3,090	3.69	2.68	6.37	
20. Sinnam-Inje	16	941	681	1,622	1.94	1.40	3.34	
21. Yuseong-Gongju	17	1,006	728	1,734	2.08	1.50	3.58	
22. Chuncheon-Hwacheon	26	1,261	914	2,175	2.60	1.89	4.49	
23. Machi-Gongju	28	1,481	1,073	2,554	3.06	2.21	5.27	
24. Goesan-Salmi	26	1,381	1,000	2,381	2.85	2.06	4.91	
25. Dongdai-Nogcheon	23	1,064	771	1,835	2.20	1.59	3.79	
26. Anseong-Janghoweon	38	2,077	1,504	3,581	4.28	3.10	7.38	
27. Seonsan-Gijisi	33	1,656	1,199	2,855	3.42	2.47	5.89	
28. Yongsan-Boeun	33	1,683	1,219	2,902	3.47	2.51	5.98	
29. Yeongcheon-Gono	29	1,571	1,137	2,708	3.24	2.34	5.58	
30. Hyeondong-Janseong	29	2,012	1,457	3,469	4.15	3.00	7.15	
31. Seoghang-Naedeog	27	1,727	1,250	2,977	3.56	2.58	6.14	
32. Manripo-Taean	15	797	577	1,374	1.64	1.19	2.83	
33. Janghoweon-Moggye	24	1,330	963	2,293	2.74	1.99	4.73	
34. Gono-Euiseong	33	1,534	1,111	2,645	3.16	2.29	5.45	
35. Miweon-Goesan	26	1,134	821	1,955	2.34	1.69	4.03	
36. Gyeongju-Pohang	23	3,449	2,498	5,947	7.11	5.15	12.26	
Subtotal A	952	55,765	40,381	96,146	114.98	83.26	198.24	42
B. Construction & Improvement of Provincial Roads								
1. Balan-Suweon	15	1,107	802	1,909	2.28	1.65	3.93	
2. Onyang-Asan Bay-Anjung	30	1,622	1,175	2,797	3.35	2.42	5.77	
3. Ungcheon-Guryeong	29	1,288	932	2,220	2.66	1.92	4.58	
4. Yecheon-Yeongju	26	1,877	1,367	3,254	3.89	2.82	6.71	
5. Cheongju-Jincheon-Gwanghaeweon	46	3,616	2,619	6,235	7.45	5.40	12.85	
6. Yangsu-Daeseong	14	676	489	1,165	1.39	1.01	2.40	
7. Anjung-Balan	20	1,361	986	2,347	2.81	2.03	4.84	
8. Gwanghaeweon-Yangji	39	2,413	1,747	4,160	4.97	3.61	8.58	
9. Gimcheon-Seonsan	21	895	648	1,543	1.84	1.34	3.18	
10. Toegyeweon-Ildong	42	1,730	1,252	2,982	3.57	2.58	6.15	
Subtotal B	282	16,595	12,017	28,612	34.21	24.78	58.99	42
Subtotal A + B	1,234	72,360	52,398	124,758	149.19	108.04	257.23	42
C. Supervision of A		882	437	1,319	1.82	0.90	2.72	33
D. Road Maintenance Equipment		582	1,843	2,425	1.20	3.80	5.00	75
E. Studies & Engineering Study of provincial & gun (county) road maintenance, & of gun road development, incl. detailed engineering of about 2,000 km		2,207	218	2,425	4.55	0.45	5.00	9
F. Training Overseas of staff of the Government		15	48	63	0.03	0.10	0 13	77
G. Contingency Allowances								
Physical /a		7,605	5,494	13,099	15.68	11.33	27.01	
Price /b		12,343	8,921	21,264	25.45	18.38	43.83	
Subtotal G		19,948	14,415	34,363	41.13	29.71	70.84	
Total A - G		95,994	69,359	165,353	197.92	143.00	340.92	42
H. Right of Way		18,090	-	18,090	37.30	-	37.30	-
Total cost of project		114,084	69,359	183,443	235.22	143.00	378.22	38

/a 10% on all items.
/b Price escalation assumed to be at annual rates of 7-1/2% in 1979 and 7% during each year thereafter for both local and foreign costs.

Sources: Ministry of Construction and consultants' estimates.
November 1978

KOREA

FOURTH HIGHWAY PROJECT

Project Implementation Schedule

Project Item (Executing Agency)	Implementation Start	Implementation Complete
Part A. Construction and Improvement of National and Provincial Roads (MOC/BPR)		
1. Prequalification of contractors	June 2, 78	Nov. 15, 78
2. Issue invitations to prequalified contractors to bid on 33 sections of national roads and 4 sections of provincial roads.		Feb. 28, 78
3. Receive and open bids on roads in 2 above, evaluation of bids by consultants, receipt by Bank of copy of evaluation report and Governments' recommendations	Apr. 30, 79	June 15, 79
4. Appoint consultants for supervision of construction and improvement and award contracts for the roads in 2 above.	May 31, 79	June 30, 79
5. Complete detailed engineering and updated economic analyses of remaining 3 sections of national roads and 6 sections of provincial roads, and send copies to Bank for comment.	June 15, 78	Feb. 28, 79
6. Issue invitations for bids on roads in 5 above.		Apr. 15, 79
7. Receive and open bids on roads in 5 above, evaluation of bids by consultants, receipt by Bank of copy of evaluation report and Government's recommendations	June 15, 79	Jul. 15, 79
8. Appoint consultants for supervision of construction and improvement and award contracts for the roads in 5 above	May 31, 79	Jul. 31, 79
9. Complete construction and improvement of 46 road sections in 2 and 5 above.		Nov. 30, 81

Project Item (Executing Agency)	Implementation Start	Implementation Complete
Part B. Procurement of Road Maintenance Equipment (MOC/BPR)		
1. Prepare list of equipment and bid documents for Road Maintenance Equipment in agreement with Bank.		May 31, 78
2. Advertise internationally inviting potential bidders to apply for bid documents.		Jul. 31, 79
3. Invite and receive bids for equipment and spare parts.	Sep. 30, 79	Dec. 31, 79
4. Evaluation of bids and receipt by the Bank of report on evaluation with Government's recommendations.		Mar. 31, 80
5. Award contracts for supply of equipment and spare parts.		Apr. 30, 80
6. Complete delivery of equipment and spare parts		Apr. 30, 81
Part C. Study of: (i) Provincial and Gun Road Organization and Maintenance; and (ii) Gun Road Development, including detailed engineering about 2,000 km (MOHA)		
1. Agreement with Bank on Government's executing agency, arrangements for managing the study and Terms of Reference.		Nov. 30, 78
2. Invite and receive proposals from consultants.	Dec. 15, 78	Jan. 31, 79
3. Issue Presidential Decree to authorize creation of Local Road Section in the Regional Development Bureau of MOHA		Jan. 31, 79
4. Set up Local Road Section, including assignment of staff (with four engineers), offices, equipment and vehicles	Feb. 1, 79	Mar. 31, 79
5. Evaluation by Government of consultants' proposals and receipt by Bank of recommendations.		Mar. 15, 79
6. Negotiate with selected consultants and award contract.		May 31, 79
7. Carry out Phase I of Study.	Jul. 1, 79	Feb. 28, 80

Project Item (Executing Agency)	Implementation Start	Implementation Complete
8. Review by Government and Bank of Phase I Report and decisions by Government on: (i) the organization and maintenance system to be adopted; and (ii) the roads to be studied in more detail to prepare the 5-year Program 1982-86.	Mar. 1, 80	May. 1, 80
9. Carry out Phase II of Study: (i) to Draft Final Report on Organization and Maintenance:	Jul. 1, 80	Mar. 31, 81
(ii) to Draft Final Report on Gun Road Development Program.	Jul. 1, 80	Dec. 31, 80
(iii) Final Reports on Phase II of study (after comments by Government and the Bank):		
(a) Organization and Maintenance	May 1, 81	June 30, 81
(b) Gun Road Development Program	Feb. 1, 81	Mar. 31, 81
10. Carry out detailed engineering and updating feasibility study:		
(i) selection by Government in consultation with the Bank of 2,000 km of roads, drafting by Government of terms of reference and list of consultants to be invited to submit proposals, and agreement with Bank.		Feb. 28, 81
(ii) invite and receive proposals, evaluation by Government, negotiation of draft contracts and receipt of drafts and recommendations by the Bank.	Mar. 15, 81	Apr. 30, 81
(iii) award contracts, start work, and carry out detailed engineering.	June. 1, 81	Feb. 28, 82
Part D. Training Overseas of Staff of the MOC (MOC/BPR)		
1. Selection by Government of first group of five trainees and arrangements with training institutions for entry and the courses to be taken.		Mar. 31, 79
2. Courses of training for first group.	Sep. 30, 79	Jul. 31, 80

Project Item (Executing Agency)	Implementation Start	Implementation Complete
3. Selection of second group of four trainees and arrangements with training institutions.		Mar. 31, 80
4. Courses of training for second group.	Sep. 30, 80	Jul. 31, 81

KOREA

FOURTH HIGHWAY PROJECT

Schedule of Estimated Disbursements

IBRD fiscal year and quarter	Cumulative disbursements at end of quarter (US$'000)
1978/79	
March 31, 1979	-
June 30, 1979	200
1979/80	
September 30, 1979	2,000
December 31, 1979	12,000
March 31, 1980	20,000
June 30, 1980	28,000
1980/81	
September 30, 1980	40,000
December 31, 1980	56,000
March 31, 1981	66,000
June 30, 1981	80,000
1981/82	
September 30, 1981	96,000
December 31, 1981	112,000
March 31, 1982	120,000
June 30, 1982	132,000
1982/83	
September 30, 1982	142,000
December 31, 1982	143,000

Source: Government/Bank estimate.

November 1978

KOREA

FOURTH HIGHWAY PROJECT

Traffic Volumes on Project Roads

	Length	Average Annual Daily Traffic 1975 Range	1975 Weighted Average/a	Forecast/a/b 1982	1987	1992	1997	2001
A. Construction and Improvement of National Roads								
1. Ssangyong-Seoghang	36	272-826	470	974	1,379	1,942	2,689	3,531
2. Yongdu-Hongcheon	23	384-458	430	1,139	1,638	2,351	3,365	4,562
3. Daegu-Gasan	19	1,287-3,571	1,636	3,237	4,734	6,963	10,375	14,577
4. Anjung-Pyeongtaeg	16	1,150	1,150	2,067	3,174	4,903	7,747	11,386
5. Sintanjin-Cheongju	20	428-637	544	1,365	1,996	2,954	4,444	6,301
6. Yeongju-Bonghwa	18	399-432	425	1,067	1,601	2,491	4,047	6,103
7. Naedeog-Sodo	23	152-354	189	455	657	965	1,448	2,052
8. Nonsan-Daejeon	32	430	430	751	1,128	1,596	2,441	3,499
9. Hangyeryeong-Yangyang	28	150-211	183	465	665	952	1,369	1,867
10. Bonghwa-Hyeondong	28	172-253	222	503	726	1,060	1,566	2,187
11. Bangrim-Jangpyeong	21	418	418	917	1,340	1,989	3,013	4,299
12. Gongju-Jeoneui	29	166-200	180	623	908	1,327	1,958	2,720
13. Weontong-Hangyeryeong	19	149-273	173	447	629	883	1,237	1,648
14. Daecheon-Machi	37	119-662	243	512	739	1,022	1,561	2,153
15. Seocheon-Buyeo	35	188-499	290	670	990	1,498	2,339	3,634
16. Nogcheon-Yesan	21	112-331	201	469	688	1,030	1,588	2,301
17. Mungog-Bangrim	35	112-308	206	474	692	1,028	1,564	2,239
18. Gijisi-Sinryeweon	27	342-609	461	1,012	1,465	2,147	3,199	4,501
19. Sogcho-Daejin	39	172-328	226	577	786	1,149	1,670	2,311
20. Sinnam-Inje	16	234	234	548	768	1,079	1,519	2,037
21. Yuseong-Gongju	17	125-143	134	647	969	1,478	2,317	3,392
22. Chuncheon-Hwacheon	26	172-256	216	481	692	1,005	1,481	2,066
23. Machi-Gongju	28	119-374	213	477	692	1,019	1,529	2,166
24. Goesan-Salmi	26	48-796	146	660	987	1,498	2,306	3,327
25. Dongdae-Nogcheon	23	112-171	163	374	544	803	1,213	1,725
26. Anseong-Janghoweon	38	158-277	242	558	815	1,213	1,848	2,652
27. Seosan-Gijisi	33	229-304	251	535	775	1,136	1,695	2,389
28. Yongsan-Boeun	33	137-172	150	422	606	870	1,250	1,700
29. Yeongcheon-Gono	29	117-283	175	403	587	870	1,316	1,876
30. Hyeondong-Jangseong	29	132	132	327	457	641	891	1,180
31. Seoghang-Naedeog	27	153-156	154	362	505	704	967	1,266
32. Manripo-Taean	15	50-134	127	298	441	673	1,062	1,565
33. Janghoweon-Moggye	24	190	190	334	507	770	1,178	1,687
34. Gono-Euiseong	33	88-188	143	339	493	731	1,111	1,590
35. Miweon-Goesan	26	89-163	124	456	673	1,008	1,531	2,186
36. Gyeongju-Pohang	23	2,470	2,470	5,570	10,400	20,100	34,000	53,000
B. Construction and Improvement of Provincial Roads								
1. Balan-Suweon	15	660	660	1,159	1,747	2,651	4,046	5,781
2. Onyang-Asan Bay-Anjung	26	479	479	877	1,361	2,128	3,437	5,132
3. Ungcheon-Guryeong	29	107-423	172	381	543	778	1,110	1,504
4. Yecheon-Yeongju	26	405	405	728	1,115	1,721	2,719	3,992
5. Cheongju-Jincheon-Gwanghaeweon	46	390	390	680	1,021	1,541	2,336	3,320
6. Yangsu-Daeseong	14	27-164	53	367	525	758	1,103	1,520
7. Anjung-Balan	20	340	340	619	957	1,488	2,382	3,531
8. Gwanghaeweon-Yangji	39	290	290	515	783	1,199	1,868	2,713
9. Gimcheon-Seonsan	21	235-316	278	628	920	1,370	2,083	2,982
10. Toegyeweon-Ildong	42	128-337	200	528	604	957	1,217	1,741

/a Weighted averages use homogeneous section distances as weights. Military traffic is excluded.

/b Forecasts include generated and diverted traffic.

Source: Consultant L. Berger; Final Report, October 1977, Vols. B0 and B40.
November 1978

Table 4.2

KOREA

FOURTH HIGHWAY PROJECT

Estimated Basic Vehicle Operating Costs/a
(in Won/km at March 1977 prices)

	Car	Taxi	Trucks			Bus
			Light	Medium	Heavy	
Basic Vehicles Running Costs			Won/km			
Fuel	5.11	5.11	6.39	8.40	14.40	13.20
Oil	.20	.20	.20	.48	1.12	.96
Tires	.54	.54	.67	2.28	5.00	4.08
Maintenance	5.21	4.86	4.45	5.26	11.20	10.57
Depreciation	8.69	6.08	5.56	6.58	14.00	13.21
Total (rounded)	19.80	16.80	17.30	23.00	45.70	42.00
Basic Vehicle Fixed Costs			000 Won/p.a.			
Crew Wages	-	1,125	780	960	1,596	2,068
Interest		183	175	322	903	828
Insurance		100	20	37	102	238
Inspection		14	8	15	40	20
Overhead		191	147	318	833	710
Total	-	1,613	1,130	1,652	3,474	3,864
Won per minute of running	-	22.40	15.70	20.40	42.90	46.80
Won per km at basic speed		16.80	14.50	18.80	39.60	36.90
Total Basic Operating Cost in Won/km	19.80	33.60	31.80	41.80	85.30	76.90

/a Basic costs refer to a vehicle operating under ideal conditions; that is on a level, tangent, good paved surface, and running at optimum speed (cars and taxis 80 km/h, trucks 65 km/h, buses 76 km/h).

Source: Consultant L. Berger; Final Report, October 1977, Vol. B0.

November 1978

Table 4.3

KOREA

FOURTH HIGHWAY PROJECT

Estimated Average Vehicle Operating Costs and Savings on Project Roads/a

(Won/km excluding tax and passenger time savings)

	Cars	Taxis	Trucks	Buses
Existing Roads				
Range	37.7-72.4	74.3-172.7	111.2-280.2	173.2-443.4
Average	47.8	99.0	153.8	240.8
Improved Roads				
Range	22.9-33.3	41.1- 56.6	60.4- 82.6	94.0-128.0
Average	26.2	47.3	68.5	107.1
Savings				
Range	13.9-43.4	32.2-122.1	52.3-206.1	81.6-327.8
Average	21.6	51.7	85.3	133.7
Average excluding extremes/b	20.6	49.2	80.3	126.4

/a Operating costs in March 1977 prices.

/b Excluding the 3 lowest and 3 highest values. The 3 highest values are on rough mountain roads with a high proportion of mining truck traffic.

Source: Consultant L. Berger; Final Report, October 1977. Vols. B0.

November 1978

Table 4.4

KOREA

FOURTH HIGHWAY PROJECT

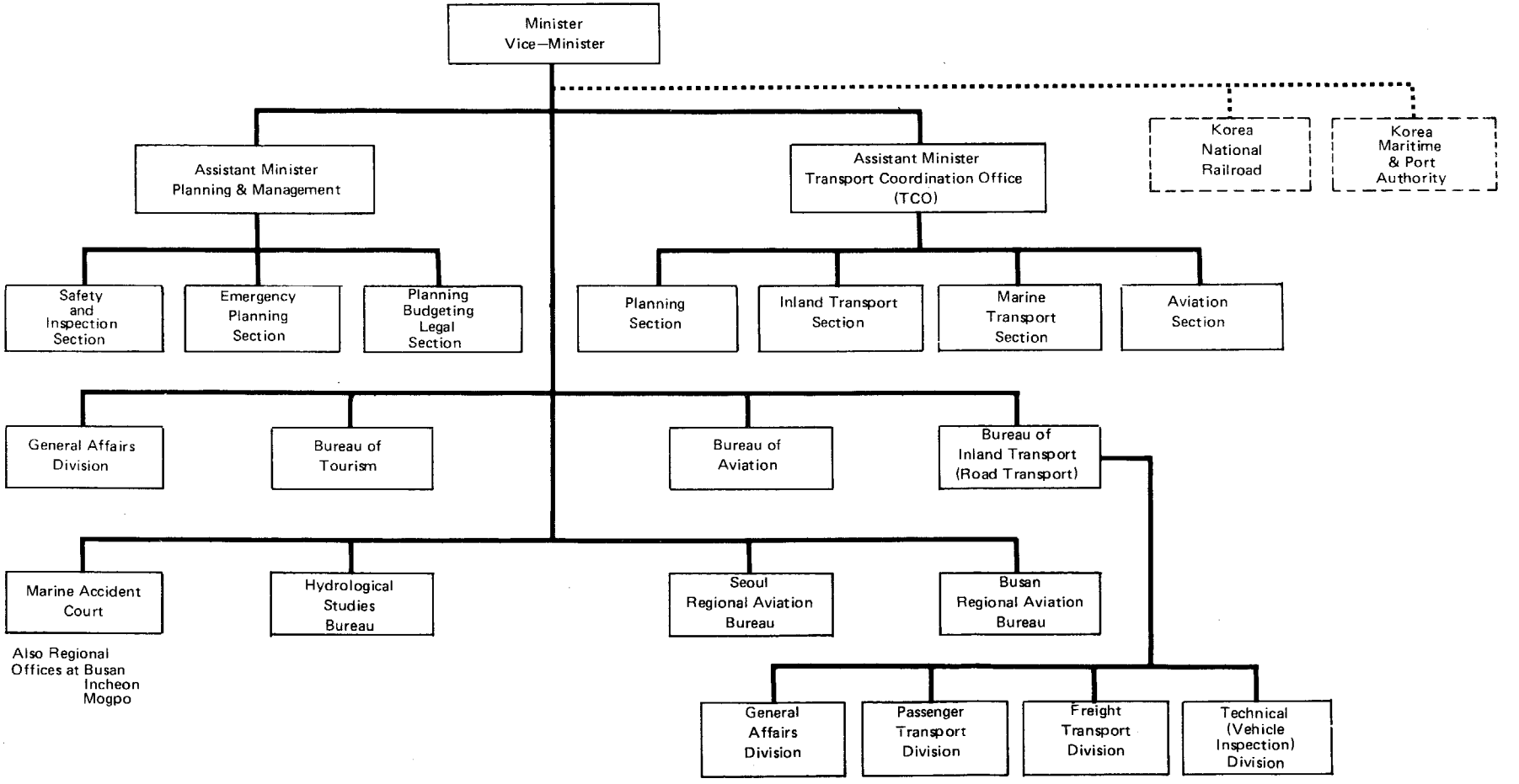
Economic Rates of Return on Project Roads

		Length km	Construction Cost/a Million Won	ERR Excluding Passenger Time Benefits	ERR Including Passenger Time Benefits
A.	Construction and Improvement of National Roads				
1.	Ssangyong-Seoghang	36	2,903	40+	40+
2.	Yongdu-Hongcheon	23	1,735	40+	40+
3.	Daegu-Gasan	19	2,187	39.5	40+
4.	Anjung-Pyeongtaeg	16	1,311	35.0	40+
5.	Sintanjin-Cheongju	20	1,597	34.6	40+
6.	Yeongju-Bonghwa	18	1,364	31.8	35.6
7.	Naedeog-Sodo	23	2,198	30.1	32.7
8.	Nonsan-Daejeon	32	2,644	30.0	33.0
9.	Hangyeryeong-Yangyang	28	1,808	29.7	34.5
10.	Bonghwa-Hyeondong	28	2,567	28.4	30.0
11.	Bangrim-Jangpyeong	21	1,356	27.7	30.7
12.	Gongju-Jeoneui	29	1,632	27.6	31.5
13.	Weontong-Hangyeryeong	19	1,351	27.5	31.3
14.	Daecheon-Machi	37	2,513	27.0	28.8
15.	Seocheon-Buyeo	35	2,470	26.4	28.7
16.	Nogcheon-Yesan	21	1,239	26.3	29.6
17.	Mungog-Bangrim	35	2,375	25.6	28.5
18.	Gijisi-Sinryeweon	27	2,477	25.4	28.3
19.	Sogcho-Daejin	39	2,348	24.7	28.4
20.	Sinnam-Inje	16	1,444	24.2	27.3
21.	Yuseong-Gongju	17	1,252	23.2	25.6
22.	Chuncheon-Hwacheon	26	1,556	23.1	26.2
23.	Machi-Gongju	28	1,968	23.0	25.4
24.	Goesan-Salmi	26	1,774	22.7	25.0
25.	Dongdae-Nogcheon	23	1,357	22.5	24.2
26.	Anseong-Janghoweon	38	2,731	21.5	23.8
27.	Seosan-Gijisi	33	2,139	21.2	23.8
28.	Yongsan-Boeun	33	2,199	21.0	23.3
29.	Yeongcheon-Gono	29	1,970	20.1	22.0
30.	Hyeondong-Jangseong	29	2,566	19.9	20.3
31.	Seoghang-Naedeog	27	2,261	17.9	19.7
32.	Manripo-Taean	15	1,014	17.0	19.0
33.	Janghoweon-Moggye	24	1,704	17.0	19.0
34.	Gono-Euiseong	33	1,930	16.7	18.3
35.	Miweon-Goesan	26	1,489	16.1	17.7
36.	Gyeongju-Pohang	23	5,243	27.1	30.5
B.	Construction and Improvement of Provincial Roads				
1.	Balan-Suweon	15	1,221	35+	35+
2.	Onyang-Asan Bay-Anjung	26	2,099	30.0	33.0
3.	Ungcheon-Guryeong	29	1,776	28.3	29.7
4.	Yecheon-Yeongju	26	2,076	28.0	31.0
5.	Cheongju-Jincheon-Gwanghaeweon	46	4,227	26.0	30.0
6.	Yangsu-Daeseong	14	909	24.9	26.3
7.	Anjung-Balan	20	1,535	24.0	25.0
8.	Gwanghaeweon-Yangji	39	2,975	24.0	26.0
9.	Gimcheon-Seonsan	21	1,241	23.7	25.6
10.	Toegyeweon-Ildong	42	2,305	20.9	23.9

/a Economic Costs (net of taxes) in March 1977 prices.

Source: Consultant L. Berger; Final Report, October 1977, Vols. B0 and B40.
November 1978

KOREA: FOURTH HIGHWAY PROJECT
MINISTRY OF TRANSPORTATION: ORGANIZATION



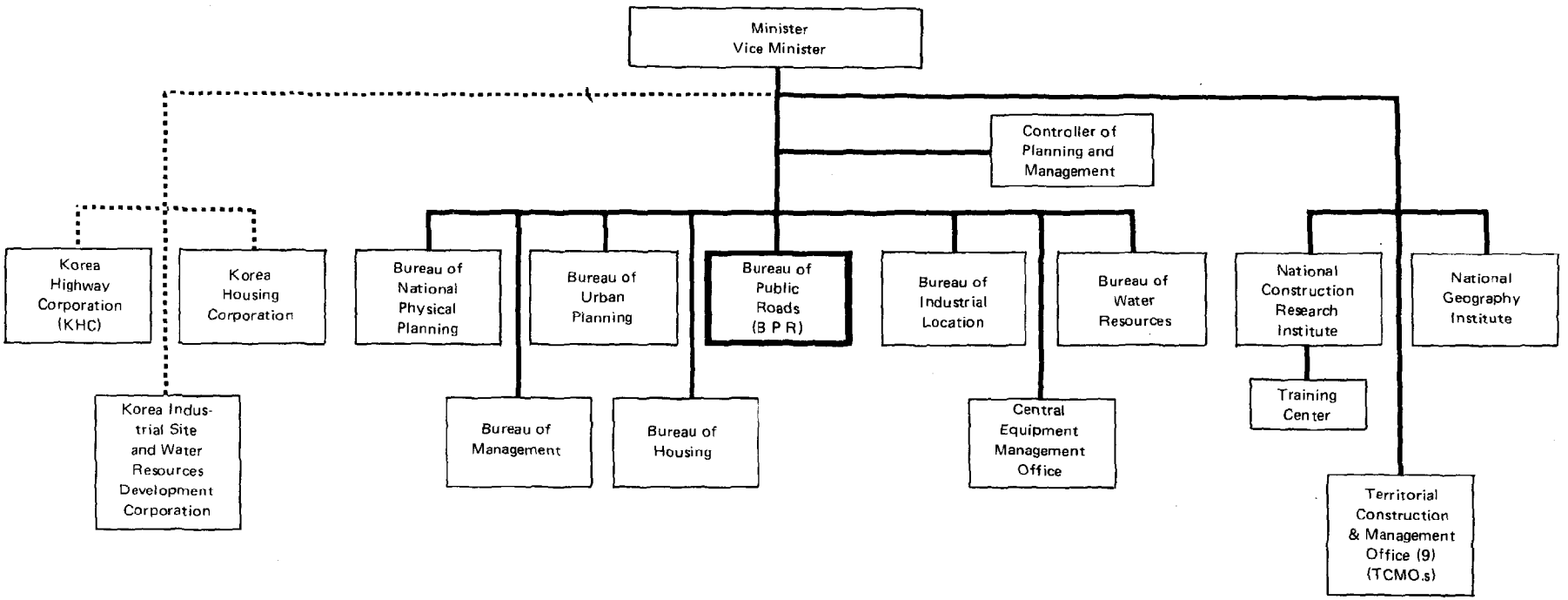
Note: Railways (KNR) and ports (KMPA) report directly through the Vice–Minister and Minister

Source: Ministry of Transportation

CHART 1

World Bank–19013

KOREA: FOURTH HIGHWAY PROJECT
MINISTRY OF CONSTRUCTION: ORGANIZATION

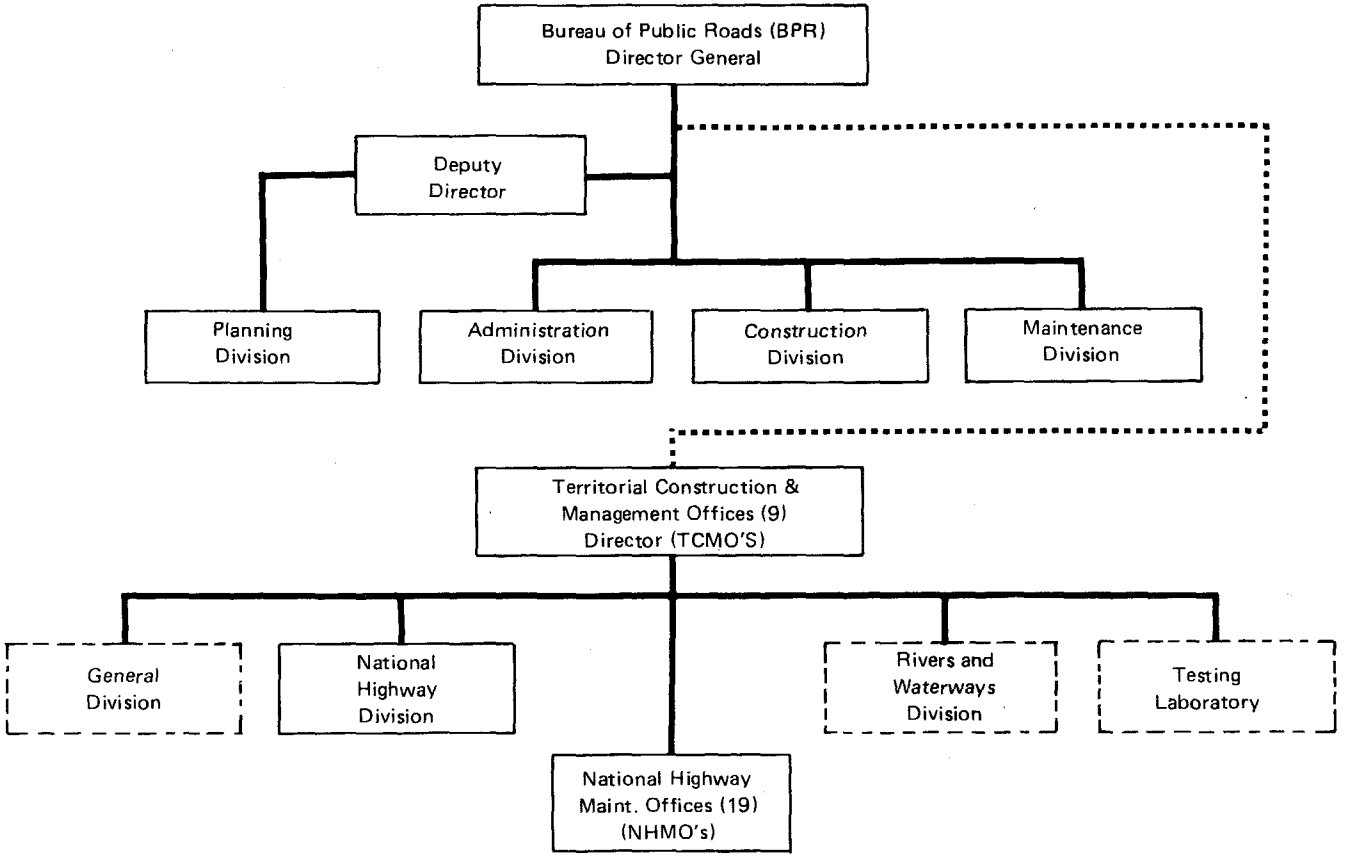


Source: Ministry of Construction

World Bank – 19014

CHART 2

KOREA: FOURTH HIGHWAY PROJECT
BUREAU OF PUBLIC ROADS: ORGANIZATION

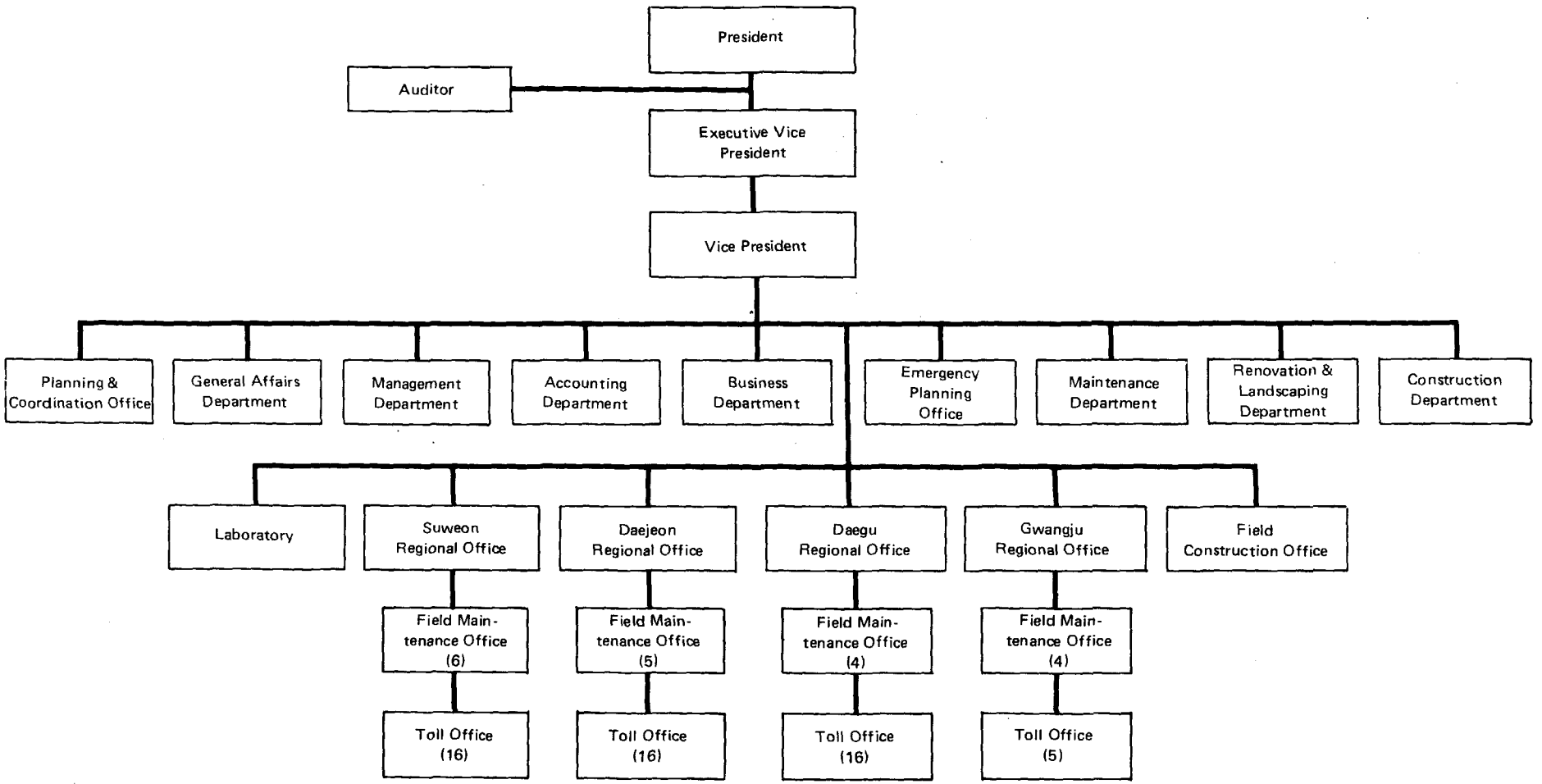


Source: Ministry of Construction

World Bank — 19015

CHART 3

KOREA: FOURTH HIGHWAY PROJECT
KOREA HIGHWAY CORPORATION: ORGANIZATION

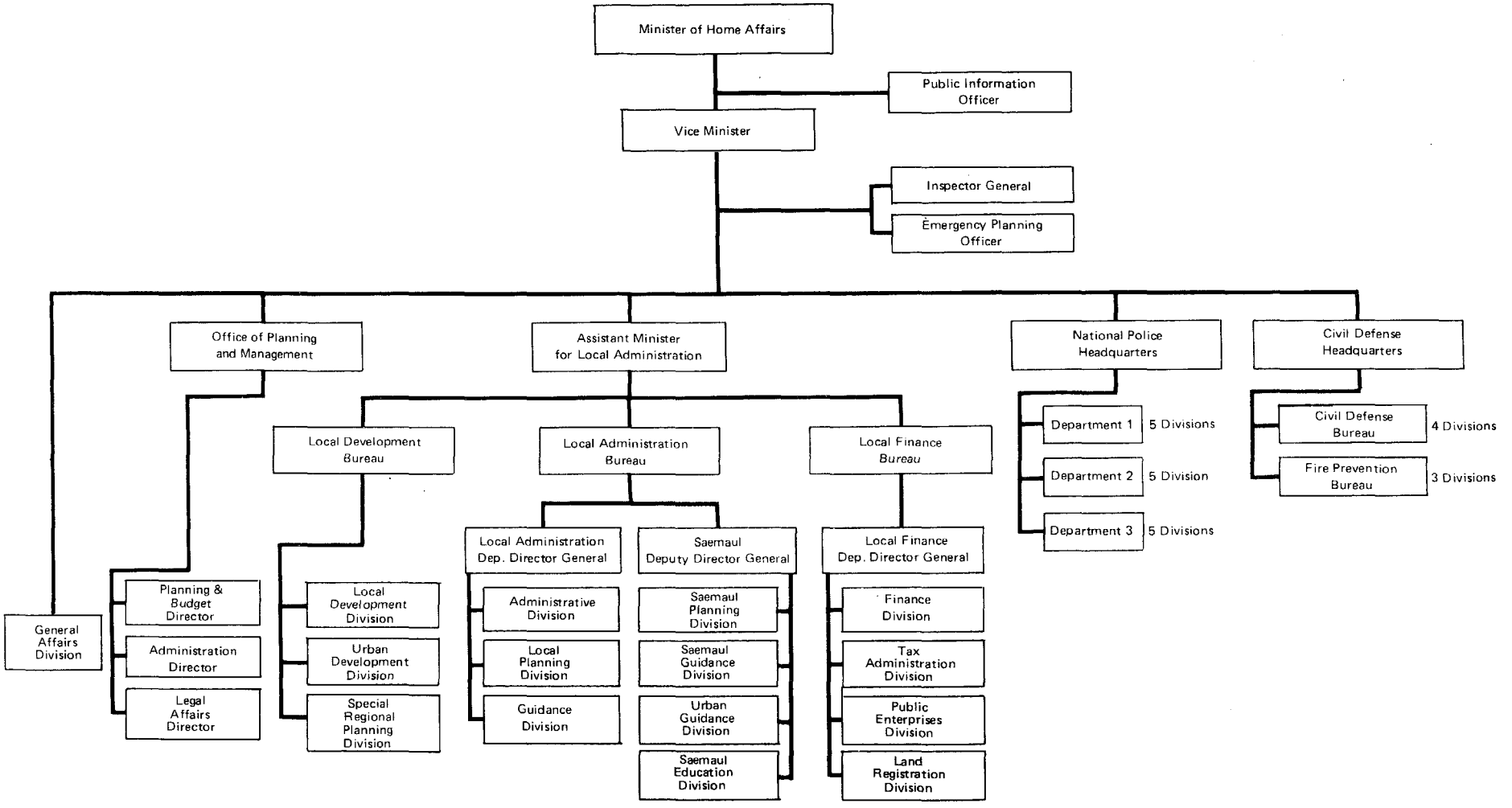


Source: Ministry of Construction

World Bank – 19016

CHART 4

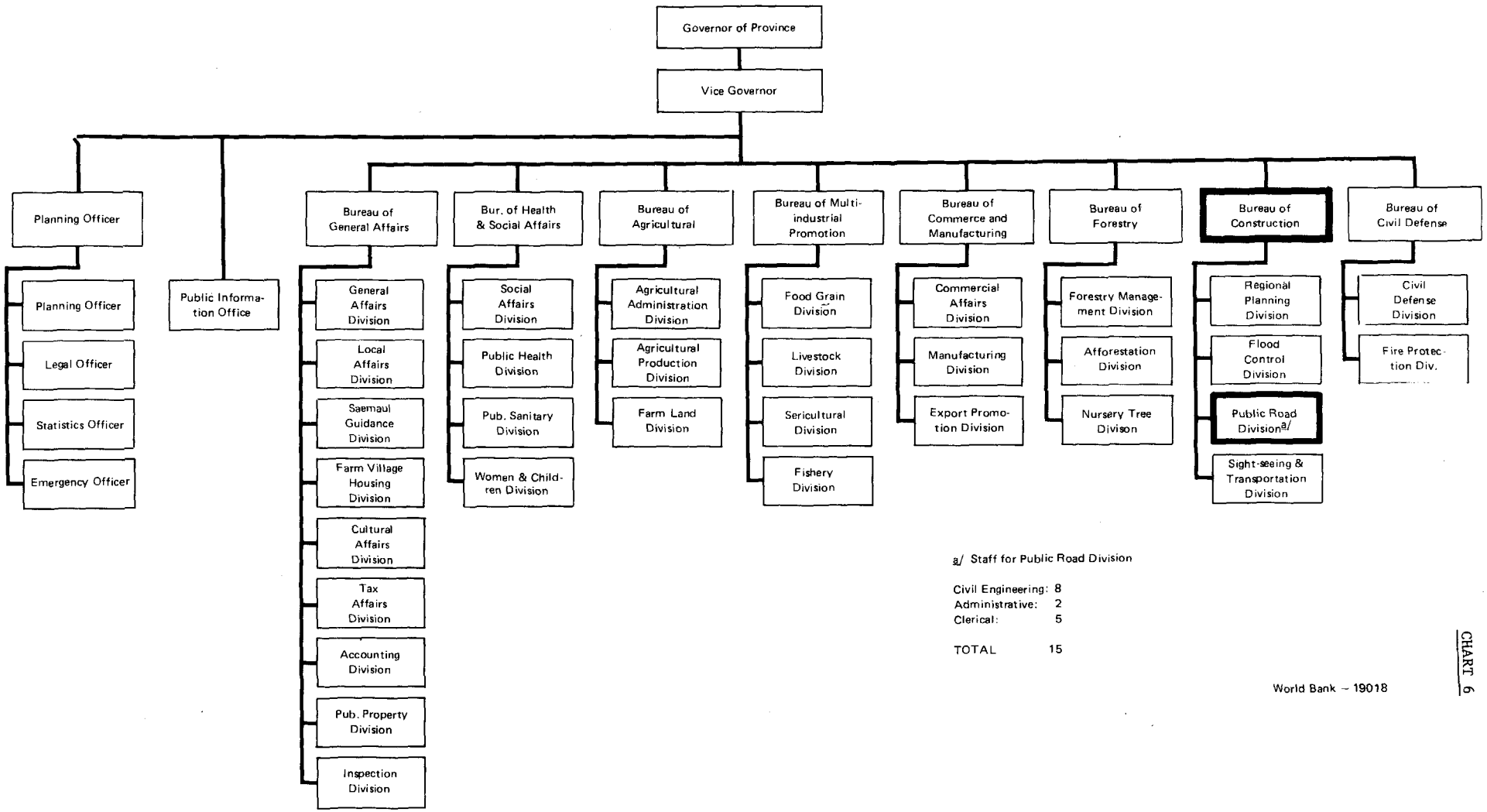
KOREA: FOURTH HIGHWAY PROJECT
MINISTRY OF HOME AFFAIRS: ORGANIZATION



Source: Ministry of Home Affairs

CHART 5

KOREA: FOURTH HIGHWAY PROJECT
A TYPICAL PROVINCE: ORGANIZATION



a/ Staff for Public Road Division

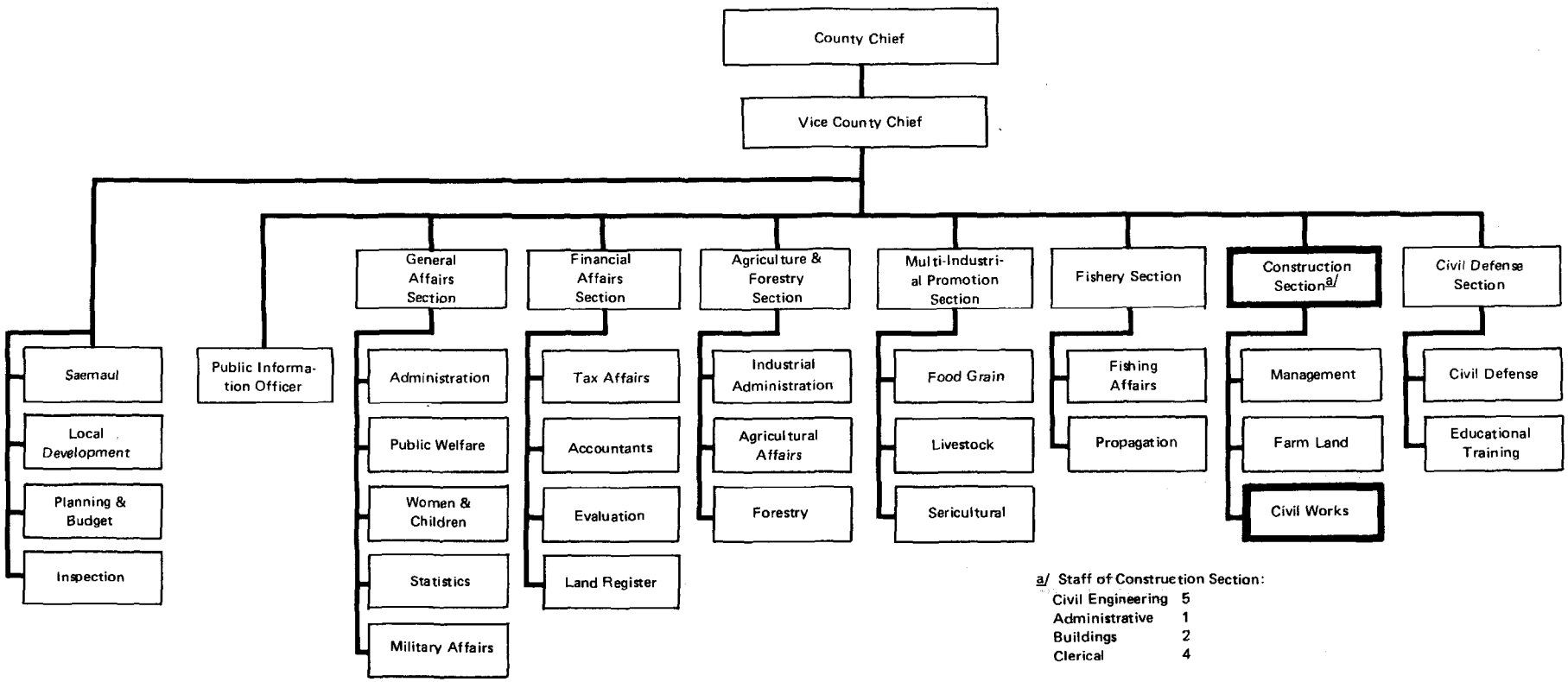
Civil Engineering:	8
Administrative:	2
Clerical:	5
TOTAL	15

World Bank – 19018

CHART 6

Source: Ministry of Construction

KOREA: FOURTH HIGHWAY PROJECT
A TYPICAL COUNTY (GUN): ORGANIZATION



a/ Staff of Construction Section:

Civil Engineering	5
Administrative	1
Buildings	2
Clerical	4
TOTAL	12

World Bank – 19019

CHART 7

Source: Ministry of Construction

KOREA

FOURTH HIGHWAY PROJECT

Selected Documents and Data Available in the Project File

A. General Reports and Studies on the Transport Sector

A-1 World Bank "Growth and Prospects of the Korean Economy", Annex F: Transport, Report No. 1489-KO.

B. General Reports and Studies Relating to the Project

B-1 "Highway Feasibility Study" Report by Louis Berger International (financed under Second Highway Project, Loan 956-KO):

"Paving and Upgrading" (5 volumes) - December 1975
(on 33 sections of national and provincial roads).

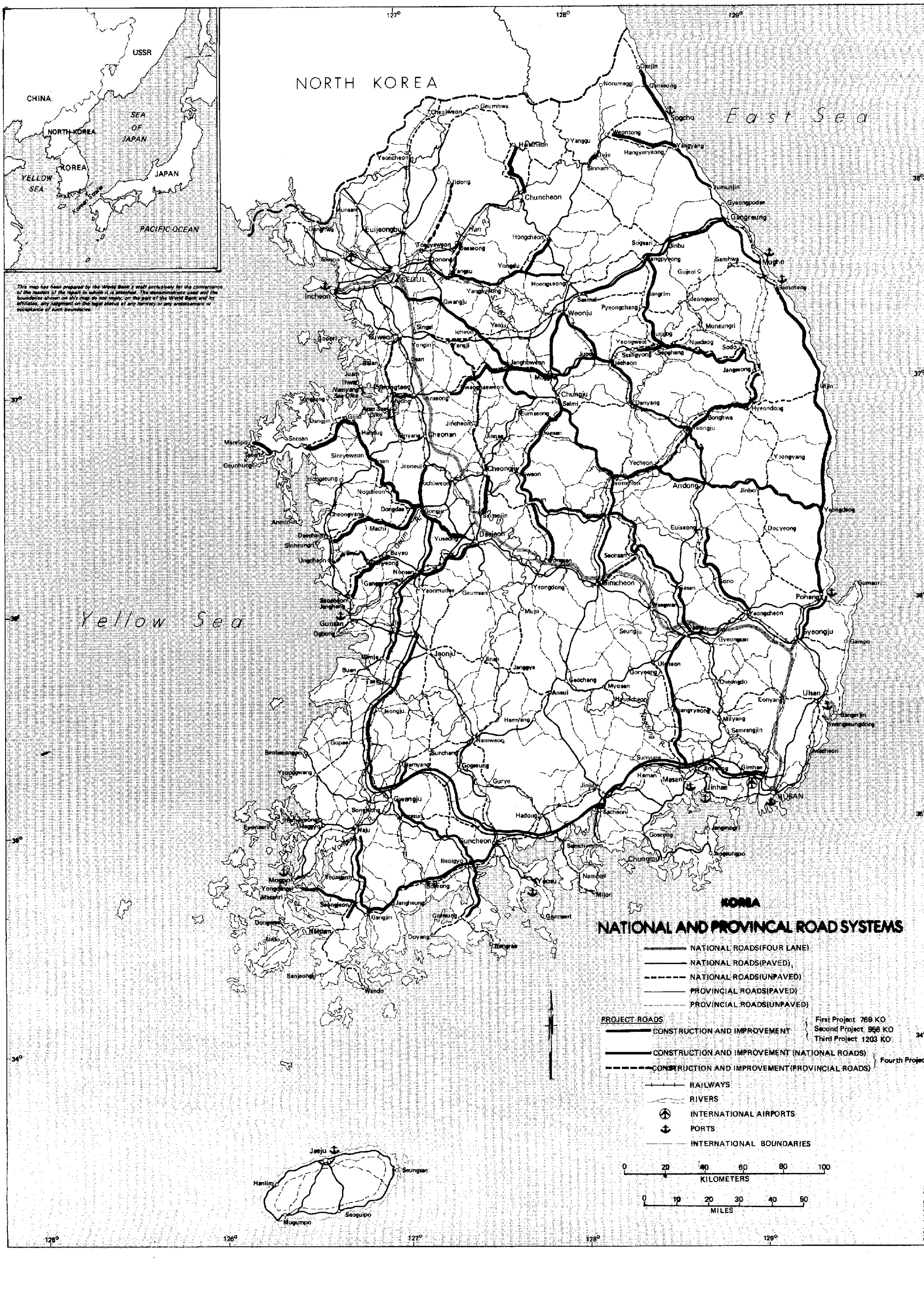
"Improvement or New Construction":
(3 volumes - May 1976, and
2 volumes - Supplementary Report - September 1976
- Addendum - January 1977.

B-2 "Highway Improvement" Report by Louis Berger International, in association with eight Korean Consulting Firms (financed under Second Highway Project, Loan 956-KO) on Detailed Engineering of 40 lots (245 volumes) - October 1977, and

"Highway Improvement Supplementary Report (Additional Roads)" by Louis Berger International (1 volume) - April 1978, on preliminary economic analysis of a further 11 sections of national and provincial roads.

C. Working Papers

C-1 Description of Project Roads, prepared by Louis Berger International - April 1978.



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